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AUTHOR Conner, Michael; Thoman, LeRoy
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ABSTRACT

The general purpose of the occupational analysis is to provide workable, basic information dealing with the many and varied duties performed in the auto mechanic occupation. It identifies the broad area of skills and knowledge necessary to perform various tasks involved in diagnosis, maintenance, and repair of automotive systems. Selected supervisory tasks involved in running a shop employing several mechanics are included. The document opens with a brief introduction followed by a job description. The bulk of the document is presented in table form. Seventeen duties are broken down into a number of tasks and for each task a two-page table is presented, showing on the first page: tools, equipment, materials, objects acted upon; performance knowledge (related also to decisions, cues and errors); safety--hazard; and on the second page: science; math--number systems; and communications (performance modes, examples, and skills and concepts). The duties include: keeping records; supervising mechanics lubricating and maintaining vehicles; servicing engine block assemblies; servicing and repairing cooling systems, fuel systems, valve trains, ignition systems, braking systems (drum and disk), steering units and A/C units; repairing and aligning front end assemblies; repairing rear axle and drive line, and standard and automatic transmissions; and maintaining and repairing electrical systems. Abbreviations of automative terms are appended. (BP)

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CE004 162

AUTO MECHANIC

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Instructional Materials Laboratory
Trade and Industrial Education
The Ohio State University

5030

AN ANALYSIS OF THE AUTO MECHANIC OCCUPATION

Developed By

Michael Connor
Auto Mechanic Instructor
Belmont County Joint Vocational School
St. Clairsville, Ohio

LeRoy Thomas
Auto Mechanic Instructor
Whitmer Skill Center
Toledo, Ohio

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Director: Tom L. Hindes
Coordinator: William L. Ashley

The Instructional Materials Laboratory
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FOREWORD

The occupational analysis project was conducted by The Instructional Materials Laboratory, Trade and Industrial Education, The Ohio State University in conjunction with the State Department of Education, Division of Vocational Education pursuant to a grant form the U.S. Office of Education.

The Occupational Analysis project was proposed and conducted to train vocational educators in the techniques of making a comprehensive occupational analysis. Instructors were selected from Agriculture, Business, Distributive, Home Economics and Trade and Industrial Education to gain experience in developing analysis documents for sixty-one different occupations. Representatives from Business, Industry, Medicine, and Education were involved with the vocational instructors in conducting the analysis process.

The project was conducted in three phases. Phase one involved the planning and development of the project strategies. The analysis process was based on sound principles of learning and behavior. Phase two was the identification, selection and orientation of all participants. The training and workshop sessions constituted the third phase. Two-week workshops were held during which teams of vocational instructors conducted an analysis of the occupations in which they had employment experience. The instructors were assisted by both occupational consultants and subject matter specialists.

The project resulted in producing one hundred two trained vocational instructors capable of conducting and assisting in a comprehensive analysis of various occupations. Occupational analysis data were generated for sixty-one occupations. The analysis included a statement of the vairous tasks performed in each occupation. For each task the following items were identified: tools and equipment; procedural knowledge; safety knowledge; concepts and skills of mathematics, science and communication needed for successful performance in the occupation. The analysis data provided a basis for generating instructional materials, course outlines, student performance objectives, criterion measures, as well as identifying specific supporting skills and knowledge in the academic subject areas.

PREFACE

This occupational analysis describes the duties and tasks required of an auto mechanic. It identifies the broad area of skills and knowledge necessary to perform various tasks involved in diagnosis, maintenance, and repair of automotive systems. Selected supervisory tasks involved in running a shop employing several mechanics are included.

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The Ohio State University
Columbus, Ohio

Jodi Beittel, Communications
Columbus, Ohio

Diana L. Buckeye, Mathematics
University of Michigan
Avon Lake, Ohio

Rick Fien, Chemistry
The Ohio State University
Beachwood, Ohio

N. S. Gidwani, Chemistry
Columbus Technical Institute
Columbus, Ohio

Bruce A. Hull, Biology
The Ohio State University
Columbus, Ohio

Donald L. Hyatt, Physics
Worthington High School
Worthington, Ohio

Glenn Mann, Communications
Columbus, Ohio

Jerry McDonald, Physical Sciences
Columbus Technical Institute
Reynoldsburg, Ohio

Colleen Osinski, Psychology
Columbus Technical Institute
Columbus, Ohio

David Porteous, Communications
University of Connecticut
Colchester, Connecticut

James A. Sherlock, Communications
Columbus Technical Institute
Columbus, Ohio

Jim VanArsdall, Mathematics
Worthington High School
Worthington, Ohio

Lillian Yontz, Biology
The Ohio State University
Caldwell, Ohio

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Marsha Opritza	Editorial Consultant
Rita Buccilla	Typist
Carol Fausnaugh	Typist
Mindy Fausnaugh	Typist
Rita Hastings	Typist
Carol Hicks	Typist
Sue Holsinger	Typist
Barbara Hughes	Typist
Carol Marvin	Typist
Kathy Roediger	Typist

JOB DESCRIPTION

The professional Auto Mechanic will be able to maintain, diagnose and repair an automobile. His or her duties will include the following: maintenance and repair of engines, cooling systems, electrical systems, fuel, exhaust and emission control systems, power trains, suspension systems, steering and alignment systems, brakes, standard and automatic transmissions and heating and air-conditioning systems; all of which pertain to the service of the automobile.

DUTY A. KEEPING RECORDS

1. Plan, schedule and control maintenance of vehicles
2. Maintain warranty records and complete P/M sheets
3. Complete work order and post inventory
4. Initiate and complete parts and supplies orders

(TASK STATEMENT) A-1 PLAN, SCHEDULE AND CONTROL MAINTENANCE OF VEHICLES

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Daily shop schedule P/M sheets Workorders Post inventory	Complete daily shop schedule Preform daily P/M sheets Complete workorders Maintain inventory	

DECISIONS	CUES	ERRORS
Determine if shop schedule is complete Determine what equipment needs P/M sheets Determine if workorder lists all parts and repairs Determine if inventory is adequate to meet needs	Too little or too much work in shop Equipment failure Loss of income No parts on hand for repairs or too large an inventory	Men not making money or can not complete all job Loss of equipment use Loss of income Incomplete jobs or too many parts on hand

(TASK STATEMENT) A-1 PLAN, SCHEDULE AND CONTROL MAINTENANCE OF VEHICLES

SCIENCE

The following principles of behavioral patterns should be included:

Professionalism
- Personality conflicts
- Communications
- Respect
  - for others
  - for tools and equipment, etc.
- Loyalty
  - To peers
    - Customers
    - Company
- Cooperative venture
  - Working together
  - Encouragement
  - Seek help of others (specialist)
  - Housekeeping

Dependability
- On time
- Regularity
- Accuracy of repair

Image
- Personal appearance
- Conduct
- Trade

MATH – NUMBER SYSTEMS

Basic Measurement Skills and Concepts
- Reading and interpreting tables, charts, and graphs
  - Logs
- Measurement: Non-geometric
  - Time/calendar
  - Weight
  - Liquid

Set of Real Numbers—Rationals

Uses of Numbers:(without calculation)
- Counting
- Indexing
- Coding—given a coding system, recognize and identify each unit involved by assigning necessary symbols, numerical or literal

Use of Computing Devices and Mechanical Aids—Calculators

Basic Statistical Skills and Concepts—Measurement of central tendency via mean (average), median, standard deviation

Basic Logic—Deductive Inductive

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	Check PM Sheets	Comprehension Terminology Process Report (Instruction)
Writing	Schedule Work Orders	Penmanship Spelling Classification Reports (Recommendations) Terminology Clarity of Expression Logic
Viewing	Post Inventory	Visual Analysis Memory Detail and Inference Recognition of Symbols

(TASK STATEMENT) A-2 MAINTAIN WARRANTY RECORDS AND COMPLETE P/M SHEETS

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Warranty records forms P/M sheet forms	Maintain warranty record file Maintain P/M sheet file	

DECISIONS	CUES	ERRORS
Determine if all customers are listed Determine if all equipment is listed	Customer with no card Equipment with no sheet	Loss of customer Equipment failure

(TASK STATEMENT) A-2 MAINTAIN WARRANTY RECORDS AND COMPLETE P/M SHEETS

SCIENCE

Liability
P/M records

The following principles of behavioral patterns should be included:

Professionalism
- Personality conflicts
- Communications
- Respect
  - for others
  - for tools and equipment, etc.
- Loyalty
  - To peers
    - Customers
    - Company
- Cooperative venture
  - Working together
  - Encouragement
  - Seek help of others (specialist)
  - Housekeeping

Dependability
- On time
- Regularity
- Accuracy of repair

Image
- Personal appearance
- Conduct
- Trade

MATH – NUMBER SYSTEMS

Basic Measurement Skills and Concepts
- Reading and interpreting tables, charts, and graphs
  - Logs
- Measurement: Non-geometric
  - Time/calendar
  - Weight
  - Liquid

Set of Real Numbers—Rationals
Uses of Numbers: (without calculation)
- Counting
- Indexing
- Coding—given a coding system, recognize and identify each unit involved by assigning necessary symbols, numerical or literal

Use of Computing Devices and Mechanical Aids—Calculators
Basic Probability Skills and Concepts
- Use of probability of mass behavior v.s. unpredictability of single events.

Basic Logic—Deductive/Inductive

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	Check PM Sheets	Comprehension Terminology Process Report (Instruction)
Writing	Schedule Work Orders	Penmanship Spelling Classification Reports (Recommendations) Terminology Clarity of Expression Logic
Viewing	Post Inventory	Visual Analysis Memory Detail and Inference Recognition of Symbols

(TASK STATEMENT) **A-3 COMPLETE WORK ORDER AND POST INVENTORY**

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Work Order Price List Catalog Inventory Cards	Examine W.O. for Errors Extend prices on parts Check parts numbers Total parts & labor prices Post parts out of stock Order parts in below stocking level	

DECISIONS	CUES	ERRORS
Determine if parts are listed correctly Determine discounts if allowed Determine correct labor costs	Check catalog Customer discount list Rate book prices	Wrong parts posted on W.O. Wrong parts posted on inventory Incorrect labor cost charges

(TASK STATEMENT) A-3 COMPLETE WORK ORDER AND POST INVENTORY

SCIENCE	MATH – NUMBER SYSTEMS

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	Price list Parts catalog	Comprehsnison Terminology
Viewing	Work order for errors	Visual Analysis
		Recognition of symbols

L1

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(TASK STATEMENT) A-4 INITIATE AND COMPLETE PARTS AND OILS ORDER

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Parts order form Oil order form	List part by name and number List oils by name, weight and type	

DECISIONS	CUES	ERRORS
Determine what parts are needed and where to buy Determine types and amount of oils needed	No parts or wrong parts on hand No oils or wrong type on hand	Job incomplete Loss of customers

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(TASK STATEMENT) A-4 INITIATE AND COMPLETE PARTS AND OILS ORDER

SCIENCE

Specifications
Viscosity

The following principles of behavioral patterns should be included:

Professionalism
- Personality conflicts
- Communications
- Respect
  - for others
  - for tools and equipment, etc.
- Loyalty
  - To peers
    - Customers
    - Company
- Cooperative venture
  - Working together
  - Encouragement
  - Seek help of others (specialist)
  - Housekeeping

Dependability
- On time
- Regularity
- Accuracy of repair

Image
- Personal appearance
- Conduct
- Trade

MATH – NUMBER SYSTEMS

Basic Measurement Skills and Concepts
- Reading and interpreting tables, charts, and graphs
  - Logs
- Measurement: Non-geometric
  - Time/calendar
  - Weight
  - Liquid

Set of Real Numbers—Rationals
Uses of Numbers: (without calculation)
- Counting
- Indexing
- Coding—given a coding system, recognize and identify each unit involved by assigning necessary symbols, numerical or literal

Use of Computing Devices and Mechanical Aids—Calculators
Basic Probability Skills and Concepts
- Use of probability of mass behavior v.s. unpredictability of single events.

Basic Logic—Deductive/Inductive
Basic Measurement Skills and Concepts
- Measurement: Geometric
  - Linear

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	Check PM Sheets	Comprehension Terminology Process Report (Instruction)
Writing	Schedule Work Orders	Penmanship Spelling Classification Reports (Recommendations) Terminology Clarity of Expression Logic
Viewing	Post Inventory	Visual Analysis Memory Detail and Inference Recognition of Symbols

DUTY B. SUPERVISING MECHANICS

1. Maintain work control and monitor workload and down time
2. Prepare time and attendance records and medical accident reports

(TASK STATEMENT) B-1 MAINTAIN WORK CONTROL AND MONITOR WORK

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON

Shop foreman check list
Daily shop schedule
Part inventory

PERFORMANCE KNOWLEDGE

Follow shop foreman's check list and assign all duties
Schedule customer cars for service and repairs
Maintain part inventory to assure minimum down time

SAFETY – HAZARD

DECISIONS

Determine if all jobs from foreman check list are complete
Determine if all customer cars are listed on daily shop schedule
Determine if all parts needed for repair are on hand

CUES

Jobs not being completed and loss of equipment use
Customer car not being serviced or repaired
No parts on hand to complete repairs

ERRORS

Loss of time and money, loss of use of shop equipment
Unsatisfied customers, loss of income
Too much down time, unsatisfied customers, loss of income

(TASK STATEMENT) B-1 MAINTAIN WORK CONTROL AND MONITOR WORK

SCIENCE

Daily work schedule
Part inventory

The following principles of behavioral patterns should be included:

Professionalism
- Personality conflicts
- Communications
- Respect
  - for others
  - for tools and equipment, etc.
- Loyalty
  - To peers
    - Customers
    - Company
- Cooperative venture
  - Working together
  - Encouragement
  - Seek help of others (specialist)
  - Housekeeping

Dependability
- On time
- Regularity
- Accuracy of repair

Image
- Personal appearance
- Conduct
- Trade

MATH – NUMBER SYSTEMS

Basic Measurement Skills and Concepts
- Reading and interpreting tables, charts, and graphs
  - Logs
- Measurement: Non-geometric
  - Time/calendar
  - Weight
  - Liquid

Set of Real Numbers—Rationals
Uses of Numbers: (without calculation)
- Counting
- Indexing
- Coding—given a coding system, recognize and identify each unit involved by assigning necessary symbols, numerical or literal

Use of Computing Devices and Mechanical Aids—Calculators
Basic Probability Skills and Concepts
- Use of probability of mass behavior v.s. unpredictability of single events.

Basic Logic—Deductive/Inductive
Basic Measurement Skills and Concepts
- Measurement: Non-geometric
  - Money/Interest

Fundamental Operations (Calculation)
Basic Arithmetic Skills and Concepts
- Finding a percent of a number and what percent one number is of another
- Ratio and proportion

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	Check PM Sheets	Comprehension Terminology Process Report (Instruction)
Writing	Schedule Work Orders	Penmanship Spelling Classification Reports (Recommendations) Terminology Clarity of Expression Logic
Viewing	Post Inventory	Visual Analysis Memory Detail and Inference Recognition of Symbols
Speaking	Instructions to mechanics	Terminology Gestures Dress

(TASK STATEMENT) B-2 PREPARE TIME AND ATTENDANCE RECORDS, MEDICAL AND ACCIDENT REPORTS

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Time cards Attendance records Medical forms Accident reports	Check and total time cards weekly Check and complete attendance records daily Complete medical reports as needed Complete accident reports as required	

DECISIONS	CUES	ERRORS
Determine if time card total matches work completed Determine if attendance record are complete Determine if medical forms are filled out properly Determine if accident report are filled out and completed as required	Number of cards turned in Absents do not match attendance reports No follow up from insurance company No follow up from front office	Mistakes in payroll Truant personal No payment from insurance company Lawsuit, lost time

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(TASK STATEMENT) B-2 PREPARE TIME AND ATTENDANCE RECORDS, MEDICAL AND ACCIDENT REPORTS

SCIENCE

Time cards
Medical reports
Accident reports

The following principles of behavioral patterns should be included:

Professionalism
- Personality conflicts
- Communications
- Respect
  - for others
  - for tools and equipment, etc.
- Loyalty
  - To peers
    - Customers
    - Company
- Cooperative venture
  - Working together
  - Encouragement
  - Seek help of others (specialist)
  - Housekeeping

Dependability
- On time
- Regularity
- Accuracy of repair

Image
- Personal appearance
- Conduct
- Trade

MATH – NUMBER SYSTEMS

Set of Real Numbers – Rationals
Uses of Numbers: (without calculation)
- Counting
- Indexing
- Recording
- Basic Measurement Skills and Concepts
- Measurement: Non-geometric
  - Time/calendar
  - Money/interest
- Reading and Interpreting Tables, Charts, and Graphs

Fundamental Operations (Calaulation)

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	Check Reports	Comprehension Terminology Process report (instruction)
Writing	Fill in time cards, Medical cards, Accident Reports Write business letters	Penmanship Spelling Classification Reports (recommendations) Terminology Clarity of expression Logic
Viewing	Check Accident Scene Check Hazard	Visual analysis Memory Detail and inference Recognition of symbols
Speaking	Report Hazard and Safety Correction	Terminology Gestures Dress

DUTY C. LUBRICATING AND MAINTAINING VEHICLES

1. Perform safety inspection, lubricate, and change oil and filters, service hardware

2. Maintain, remove, repair or replace tires

(TASK STATEMENT) **C-1 PERFORM SAFETY INSPECTION, LUBRICATE, CHANGE OIL & FILTERS AND SERVICE HARDWARE**

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON

Grease pan
Drain pan
Oil and fuel filter wrench
Oil can
Oil can cutter

Chassis & tires
Oil Pan
Filter mountings
Hardware

PERFORMANCE KNOWLEDGE

Safety inspection
Lube chassis
Change oil
Change oil and fuel filter
Lube hardware

SAFETY – HAZARD

Wear safety glasses
Do not remove radiator cap if engine is hot

Foreign material may get into eyes
Would get burned from steam pressure

DECISIONS

Determine if safety items will meet manufacture specifications
Determine what type of lube to use
Determine what type of oil to use
Determine if the replacement filters meet manufacture specifications
Determine what type of lube to use on hardware

CUES

Loose or worn parts
Owner's manual
Parts manual

ERRORS

Accidents
Engine damage
Road failure

C-1 PERFORM SAFETY INSPECTION, LUBRICATE, CHANGE OIL & FILTERS AND SERVICE HARDWARE

(TASK STATEMENT)

SCIENCE

Engine oils
Lube
Oil pump
Engine oils
Lube and oils
Fan belts

The following principles of behavioral patterns should be included:

Professionalism
- Personality conflicts
- Communications
- Respect
  - for others
  - for tools and equipment, etc.
- Loyalty
  - To peers
    - Customers
    - Company
- Cooperative venture
  - Working together
  - Encouragement
  - Seek help of others (specialist)
  - Housekeeping

Dependability
- On time
- Regularity
- Accuracy of repair

Image
- Personal appearance
- Conduct
- Trade

MATH – NUMBER SYSTEMS

Basic Logic
- Deductive inductive

Basic Measurement Skills and Concepts
- Instruments: ruler compass protractor clinometer tape calipers micrometer thermometer barometer tachometer and others.
- Metric and English measure and conversion
- Measurement: Geometric
  - Volume
- Measurement: Non-geometric
  - Liquid
- Reading and Interpreting tables, charts, and graphs
  - Logs

Set of Real Numbers
- Rationals

Fundamental Operations (Calculation)
- Addition algorithm
- Subtraction algorithm

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	Check Lube & Oil Charts	Comprehension Terminology
Writing	Fill in PM report	Penmanship Spelling Reports (Recommendations) Terminology
Listening	For Abnormal Sounds (squeaks; rattles, knocks, etc.)	Auditory Discrimination
Viewing	Rust, Bends, Tears, etc. Rough, broken glass	Visual analysis Describing Logic Detail and inference
Touching		Temperature Consistency
Smelling	Oil or gas fumes or burning	Odor (oil) (coolant)

C-2 MAINTAIN, REMOVE, REPAIR OR REPLACE TIRES (INSPECT & SERVICE TIRES)

(TASK STATEMENT)

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TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON

Tire changer
Rubber lube
Wheel wrench
Jack
Pressure gauge
Patching

Wheels
Tires

PERFORMANCE KNOWLEDGE

Inspect
Check air pressure
Repair flats
Replace tires

SAFETY – HAZARD

Wear safety glasses
Proper use of tools

Foreign materials could get in eyes
Hands, hair, loose clothing could catch in moving parts

DECISIONS

Determine if these tires will provide trouble free performance
Determine proper air pressure
Use proper type of repair
Determine what type tire to replace with

CUES

Cuts, breaks, tread wear, air loss

ERRORS

Flat tire
Accident

C-2 MAINTAIN, REMOVE, REPAIR OR REPLACE TIRES (INSPECT & SERVICE TIRES)

(TASK STATEMENT)

SCIENCE	MATH – NUMBER SYSTEMS
Tire changer Wheel wrench Tire Road friction Tire body	Set of Real Numbers – Whole numbers Basic Measurement Skills and Concepts Measurement: Geometric Volume Instruments: Measurement: Non-geometric [Pressure] Basic Logic Deductive inductive

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Speaking	Customer complaint	Terminology
Reading	Charts—tire pressure, size	Comprehension Terminology
Writing	Report condition, repairs, & cost.	Penmanship Spelling Reports
Listening	Air Leak	Auditory discrimination
Viewing	Abnormal wear patterns	Visual analysis Logic Symbols & codes
Touching	Rough trend or lumps, or featheredging	Shape

DUTY D. SERVICING AND REPAIRING COOLING SYSTEMS

1. Diagnose cooling and heating systems problems
2. Replace cooling systems components

(TASK STATEMENT) **D-1 DIAGNOSE COOLING AND HEATING SYSTEMS PROBLEMS**

TOOLS, EQUIPMENT, MATERIALS OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Light Inspection mirror Pressure tester Belts Fan Hoses Radiator Heater core Freeze plugs	Visually inspect belts for cracks, breaks, glazing, and tension Inspect fan Inspect hoses for cracks or deterioration Inspect radiator & heater cores for leaks and mounting problems	Wear safety glasses Make sure engine is off and will not start Do not remove radiator cap if engine is hot Foreign material or steam could get in eyes Hands or hair or loose clothing could catch in moving parts Would get burned by steam pressure

DECISIONS	CUES	ERRORS
Determine if these units provide trouble free performance	Leaks, noises, overheating complaints	Engine overheating Result Road breakdown Engine damage

(TASK STATEMENT) D-1 DIAGNOSE COOLING AND HEATING SYSTEMS PROBLEMS

SCIENCE

Fan belts and pulleys
Water pump
Pressure caps
Water pump
Hydrometer
Radiator
Fan belts and hoses

The following principles of behavioral patterns should be included:

Professionalism
- Personality conflicts
- Communications
- Respect
  - for others
  - for tools and equipment, etc.
- Loyalty
  - To peers
    - Customers
    - Company
- Cooperative venture
  - Working together
  - Encouragement
  - Seek help of others (specialist)
  - Housekeeping

Dependability
- On time
- Regularity
- Accuracy of repair

Image
- Personal appearance
- Conduct
- Trade

MATH – NUMBER SYSTEMS

Basic Logic – Deductive/inductive
Set of Real Numbers – Rationals
Uses of Numbers: (Without calculation)
- Ratio

Basic Measurement Skills and Concepts
- Measurement: Geometric
  - Volume
- Measurement: Non-geometric
  - Temperature
  - Liquid [Coolant]

- Reading and Interpreting Tables, Charts, and Graphs
  - Logs – [Coolant mixing chart]
- Instruments:
  - [Pressure tester, hydrometer]

Basic Arithmetic Skills and Concepts
- Ratio and proportion
- [Coolant solution]

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Speaking	Customer complaint	Terminology Logic Gestures
Reading	Chart, Hydrometer	Comprehension Informational reports Terminology
Writing	Evaluate, cost estimate	Penmenship Spelling Terminology Logic
Listening	Overheat Boiling Sounds	Auditory discrimination Logic
Viewing	Visual signs, leaks, etc.	Visual analysis
Touching		Temperature
Smelling	Burning	Odor

(TASK STATEMENT) D-2 REPLACE COOLING SYSTEM COMPONENTS

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON

S.T.K.
Pressure tester

Water pump
Hoses
Belts
Thermostat
Fan
Radiator core
Heater core
Freeze plugs

PERFORMANCE KNOWLEDGE

Replace water pump
Replace hoses
  Heater
  Cooling systems
Replace thermostat
Replace radiator core
Replace heater core
Replace freeze plugs

SAFETY – HAZARD

Wear safety glasses

Proper use of hand tools

Make sure engine will not start
Wait till engine cools before removing cap

Foreign material or steam could get in eyes
Hands, hair, loose clothing could catch in moving parts

Would get burned by water or steam under pressure

DECISIONS

Determine if the cooling system will operate properly
Determine if the coolant mixture is correct

CUES

Visible leaks
Coolant not circulating
Hydrometer shows coolant not adequate

ERRORS

Heater malfunction
Engine overheating
Engine damage
Engine freeze up

(TASK STATEMENT) D-2 REPLACE COOLING SYSTEM COMPONENTS

SCIENCE

Simple machines used to gain mechanical advantage—Fans belts and pulleys
Work input, work output, friction and efficiency in simple machines—Water pump
Fluids under pressure—Pressure caps
Centrifugal forces developed by bodies in rotation—Water pump
Resistance of materials to change in shape—Fan belts and hoses

The following principles of behavioral patterns should be included:

Professionalism
- Personality conflicts
- Communications
- Respect
  - for others
  - for tools and equipment, etc.
- Loyalty
  - To peers
    - Customers
    - Company
- Cooperative venture
  - Working together
  - Encouragement
  - Seek help of others (specialist)
  - Housekeeping

Dependability
- On time
- Regularity
- Accuracy of repair

Image
- Personal appearance
- Conduct
- Trade

MATH – NUMBER SYSTEMS

Basic Logic
- Deductive inductive

Set of Real Numbers
- Rationals

Uses of Numbers: (without calculation)
- Ratio

Basic Measurements Skills and Concepts
- Measurement: Geometric
  - Linear—[Length of heater hose]
  - Volume
- Measurement: Non-geometric
  - Temperature
  - Liquid—[Coolant]
  - [Pressure]
- Reading and Interpreting Tables, Charts, and Graphs
  - Logs—[Coolant mixing chart]
- Instruments:

Basic Arithmetic Skills and Concepts
- Ratio and proportion—[Coolant solution]

Basic Algebra Skills and Concepts
- Manipulation of formulae—[for every 1 lb. pressure, 30 rise]
- Substitute given values in order to find the value of the required unknown—[in boiling point]

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Speaking	Customer complaint	Terminology Logic Gestures
Reading	Chart, Hydrometer	Comprehension Informational Reports Terminology
Writing	Evaluate, Cost estimate	Penmanship Spelling Terminology Logic
Listening	Boiling Sounds	Auditory discrimination Logic
Viewing	Visual signs, leaks, etc.	Visual analysis
Touching	Overhot	Temperature
Smelling	Burning	Odor

DUTY E. SERVICING AND REPAIRING FUEL SYSTEMS

1. Diagnose fuel systems problems
2. Test repair and/or replace fuel system components

(TASK STATEMENT) E-1 DIAGNOSE FUEL SYSTEM PROBLEMS

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
S.T.K. Fuel pump pressure gauge Combustion analyzer Vacuum Gauge Fuel pump Carburetor Lines Fuel tank Fuel filters Intake manifold	Test fuel pump pressure Analyze combustion Test manifold vacuum	Use safety glasses Fire extinguisher handy Disconnect & ground coil high tension wire Gas spray in eyes Fire could result with fuel Spark could set fire to spilled fuel

DECISIONS	CUES	ERRORS
Determine condition of pump Determine combustion efficiency Determine vacuum level	Pump pressure as specified Correct combustion level Correct vacuum level	Car will not run Car will run poorly Will lose mileage

(TASK STATEMENT) E-1 DIAGNOSE FUEL SYSTEM PROBLEMS

SCIENCE

Simple machines used to gain mechanical advantage—Fuel pump
Transfer of energy from one form to another—Combustion

The following principles of behavioral patterns should be included:

Professionalism
- Personality conflicts
- Communications
- Respect
  - for others
  - for tools and equipment, etc.
- Loyalty
  - To peers
    - Customers
    - Company
- Cooperative venture
  - Working together
  - Encouragement
  - Seek help of others (specialist)
  - Housekeeping

Dependability
- On time
- Regularity
- Accuracy of repair

Image
- Personal appearance
- Conduct
- Trade

MATH – NUMBER SYSTEMS

Basic Logic
- Deductive/inductive

Basic Measurement Skills and Concepts
- Instruments:
- Measurement: Geometric
  - Liquid
  - [Pressure (ibs. sq. in)]
  - [Vacuum (in of hg.)]
  - [Emission control (combustion analyzer—p.p.m.)]
- Reading and Interpreting Tables, Charts and Graphs
  - Time/calendar—[Logs—spec. chart]
  - [Infrared conversion chart]

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Speaking	Customer Complaint	Terminology Logic
Reading	Chart—specifications, Gauges	Comprehension Terminology
Writing	Cost Estimate	Penmanship Spelling Reports Logic
Listening	Uneven idle	Auditory discrimination Logic
Viewing	Fuel Leak	Visual analysis Logic Symbols and codes
Smelling	Fuel Leaks	Gasoline Odors

(TASK STATEMENT) **E-2 REPAIR FUEL SYSTEM COMPONENTS**

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
S.T.K. Fuel pump pressure gauge Combustion analyzer Vacuum gauge Fuel pump Carboretor Lines Fuel tank Fuel filters Intake manifold	Replace carbuetor Replace lines Replace fuel pump Replace fuel filters Replace intake manifold	Use safety glasses Fire extinguisher handy Do not crank engine with carburetor off Gas spray in eyes Presence of gasoline is always dangerous Spark from ignition will ignite fuel

DECISIONS	CUES	ERRORS
Determine if the fuel systems will operate as specified	Fuel pump pressure is low Combustion mixture is wrong The fuel lines are pinched or free Fuel filters are clear There is a vacuum leak	Poor performance Poor mileage

(TASK STATEMENT) · E-2 REPAIR FUEL SYSTEM COMPONENTS

SCIENCE

Simple machines used to gain mechanical advantage—Fuel pump
Transfer of energy from one form to another—Combustion

The following principles of behavioral patterns should be included:

Professionalism
- Personality conflicts
- Communications
- Respect
  - for others
  - for tools and equipment, etc.
- Loyalty
  - To peers
    - Customers
    - Company
- Cooperative venture
  - Working together
  - Encouragement
  - Seek help of others (specialist)
  - Housekeeping

Dependability
- On time
- Regularity
- Accuracy of repair

Image
- Personal appearance
- Conduct
- Trade

MATH – NUMBER SYSTEMS

Basic Logic
- Deductive/inductive

Basic Measurement Skills and Concepts
- Instruments: ruler/compass/protractor/clinometer/tape/calipers micrometer/thermometer/barometer/tachometer/fuel pressure gauge/vacuum gauge/combustion analyze/and others

- Measurement: Non-geometric
  - Liquid
  - [Pressure (lbs. sq. in.)]
  - [Vacuum (in. of hg.)]
  - [Emission control (combustion analyzer—p.p.m.)]
- Reading and Interpreting Tables, Charts, and Graphs
  - Time/calendar—Logs, spec. chart
  - [Infrared conversion chart]

Set of Real Numbers
- Rationals

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Speaking	Customer Complaint	Terminology Logic
Reading	Chart—Specifications, Gauges	Comprehension Terminology
Writing	Cost estimate	Penmanship Spelling Reports Logic
Listening	Uneven idle	Auditory discrimination Logic
Viewing	Fuel Leak	Visual analysis Logic Symbols and codes
Smelling	Fuel Leaks	Gasoline odors

DUTY F. SERVICING ENGINE BLOCK ASSEMBLIES

1. Diagnose engine problems
2. Clean, disassemble, inspect block assembly components
3. Service piston and reassembly
4. Service crankshaft and bearing

(TASK STATEMENT) F-1 DIAGNOSE ENGINE PROBLEMS (BLOCK)

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
S.T.K. Universal oil pressure gauge Compression gauge Mechanics stethoscope Chassis dynamometer Cylinder leak tester Engine block Piston & rod assemblies Crank Shaft & bearings Oil pump	Check oil pressure Check compression Perform leak down test Listen for noises Dyno. test	Wear safety glasses Beware of electric shock Care of moving parts Dirt or foreign material could fly in eye With engine running, stethoscope may touch spark plug or wire Running engine could catch loose clothing or long hair, etc.

DECISIONS	CUES	ERRORS
Determine if oil pressure is low Determine if wet compression test is low Determine if cylinder leakage is correct Check noise level Determine test results	Low oil pressure Abnormal noise Poor performance	Oil consumption Critical engine damage

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(TASK STATEMENT) F-1 DIAGNOSE ENGINE PROBLEMS (BLOCK)

SCIENCE

Simple machines used to gain mechanical advantage—Gears, levers, pulleys
Work input, work output, friction and efficiency in simple machines—Horse power output
Fluids under pressure—Oil and fuel
Transfer of heat from one body to another—From combustion chamber to water jackets
Effects of friction on work processes and product quality—Power loss due to friction

The following principles of behavioral patterns should be included:

Professionalism
- Personality conflicts
- Communications
- Respect
  - for others
  - for tools and equipment, etc.
- Loyalty
  - To peers
    - Customers
    - Company
- Cooperative venture
  - Working together
  - Encouragement
  - Seek help of others (specialist)
  - Housekeeping

Dependability
- On time
- Regularity
- Accuracy of repair

Image
- Personal appearance
- Conduct
- Trade

MATH – NUMBER SYSTEMS

Set of Real Numbers
- Rationals

Uses of Numbers: (Without calculation)
- Compression Ratio

Basic Arithmetic Skills and Concepts
- Changing fractions to decimal and decimal to fractions—Bore and crankshaft
- Rounding off decimals and whole numbers—Crankshaft and camshaft

Basic Measurement Skills and Concepts
- Instruments—Micrometer Tachometer
- Given an Instrument of Measure, determine precision and or accuracy with respect to relative error, significant digits, and tolerance—Crankshaft and bore
- Metric and English measure and conversion
- Measurement: Non-geometric
  - Liquid—Oil pressure
  - [Pressure]

Basic Algebra Skills and Concept
- Uses of variables
  - In formulas (cubic inch displacement)

Basic Logic
- Deductive inductive

Basic Geometry Skills and Concepts
- Determination of area and volume of cylinders

Fundamental Operations (Calculation)

Use of computing devices and mechanical aids
- Calculators
- Computers

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Speaking	Customer Complaint, Special checks	Terminology Logic
Reading	Specification Chart, Test Gauges & Instruments	Comprehension Terminology
Writing	Report—Cost estimate	Penmanship Spelling Terminology Logic
Listening	Squeaks, knocks, rattles	Auditory discrimination
Viewing	Oil leaks—fuel leaks	Visual analysis Symbols and codes
Touching	Rough or worn parts	Size Shape Temperature
Smelling	Burned or contaminated oil	Engine oil odors

(TASK STATEMENT) F-2 DISASSEMBLE, CLEAN AND INSPECT COMPONENT

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
S.T.K. Cleaning solvents Ridge reamer Block Piston & rod assemblies Crank shaft & bearings Oil pump	Replace engine Disassemble engine Clean block & parts Inspect components	Wear safety glasses Fire extinguisher handy Secure engine Solvents or other foreign material may lodge in eye Solvents or fuels are flamable May fall and cause bodily injury

DECISIONS	CUES	ERRORS
Determine if it is necessary to remove the engine Determine what parts are functional	Diagnosis shows need to remove Cracked or broken parts Worn parts	Engine damaged Engine destroyed

(TASK STATEMENT) F-2 DISASSEMBLE, CLEAN AND INSPECT COMPONENT

SCIENCE

Simple machines used to gain mechanical advantage—Gears, levers, pulleys
Work input, work output, friction and efficiency in simple machines—Horse power output
Fluids under pressure—Oil and fuel
Transfer of heat from one body to another—From combustion chamber to water jackets
Effects of friction on work processes and product quality—Power loss due to friction

The following principles of behavioral patterns should be included in this course.

Professionalism
- Personality conflicts
- Communications
- Respect
  - for others
  - for tools and equipment, etc.
- Loyalty
  - To peers
    - Customers
    - Company
- Cooperative venture
  - Working together
  - Encouragement
  - Seek help of others (specialist)
  - Housekeeping

Dependability
- On time
- Regularity
- Accuracy of repair

Image
- Personal appearance
- Conduct
- Trade

MATH – NUMBER SYSTEMS

Set of Real Numbers
- Rationals

Uses of Numbers: (without calculation)
- Ratio—Compression

Basic Arithmetic Skills and Concepts
- Changing fractions to decimal and decimal to fractions—Bore and crankshaft
- Rounding off decimals and whole numbers—Crankshaft and camshaft

Basic Measurement Skills and Concepts
- Instruments—Micrometer, tachometer
- Given an Instrument of Measure, determine precision and or accuracy with respect to relative error, significant digits, and tolerance—Crankshaft and bore
- Metric and English measure and conversion
- Measurement: Non-geometric
  - Liquid—Oil pressure
  - [Pressure]
- Reading and interpreting tables, charts, and graphs—Torque spec. charts

Basic Algebra Skills and Concepts
- Uses of variables
  - In formulas (Cubic inch displacement)

Basic Logic
- Deductive inductive

Basic Geometry Skills and Concepts
- Determination of area and volume of cylinders

Fundamental Operations (Calculation)

Use of computing devices and mechanical aids
- Calculators
- Computers

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Speaking	Customer complaint, Special checks	Terminology Logic
Reading	Specification Chart, Test Gauges & Instruments	Comprehension Terminology
Writing	Report—Cost estimate	Penmanship Spelling Terminology Logic
Listening	Squeaks, knocks, rattles	Auditory discrimination
Viewing	Oil leaks—fuel leaks	Visual analysis Symbols and codes
Touching	Rough or worn parts	Size Shape
Smelling	Burned or contaminated oil	Engine oil odors

(TASK STATEMENT) F-3 SERVICE PISTON AND ROD ASSEMBLY

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON

S.T.K.
Foot pound torque wrench
Ring groove cleaner
Thickness gauge
Ring installation tool

Pistons
Rods
Piston Pins
Rings

PERFORMANCE KNOWLEDGE

Inspect pistons for cracks
Inspect piston ring groove for width wear
Inspect piston pins
Inspect rod alignment
Install rods and rings on pistons

SAFETY – HAZARD

Wear safety glasses
Correct use of hand tools

Chips from ring groove tool
Sharp edges on pistons & rings

DECISIONS

Determine if pistons are operable
See if piston pins are worn or locks are o.k.
Determine if rings will fit correctly
Determine that rods are not twisted or bent

CUES

Cracked piston skirts
Worn ring grooves
Abnormal wear pattern on pistons

ERRORS

Pistons cracked will destroy engine
Bent rods will knock

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(TASK STATEMENT) F-3 SERVICE PISTON AND ROD ASSEMBLY

SCIENCE

Simple machines used to gain mechanical advantage—Gears, levers, pulleys
Work input, work output, friction and efficiency in simple machine—Horse power output
Fluids under pressure—Oil and fuel
Transfer of heat from one body to another—From combustion chamber to water jackets
Effects of friction on work processes and product quality—Power loss due to friction

The following principles of behavioral patterns should be included:

Professionalism
- Personality conflicts
- Communications
- Respect
  - for others
  - for tools and equipment, etc.
- Loyalty
  - To peers
    - Customers
    - Company
- Cooperative venture
  - Working together
  - Encouragement
  - Seek help of others (specialist)
  - Housekeeping

Dependability
- On time
- Regularity
- Accuracy of repair

Image
- Personal appearance
- Conduct
- Trade

MATH — NUMBER SYSTEMS

Set of Real Numbers
- Rationals

Uses of Numbers: (Without calculation)
- Compression Ratio

Basic Arithmetic Skills and Concepts
- Changing fractions to decimal and decimal to fractions—Bore and crankshaft
- Rounding off decimals and whole numbers—Crankshaft and camshaft

Basic Measurement Skills and Concepts
- Instruments—Micrometer Tachometer
- Given an Instrument of Measure, determine precision and or accuracy with respect to relative error, significant digits, and tolerance—Crankshaft and bore
- Metric and English measure and conversion
- Measurement: Non-geometric
  - Liquid—Oil pressure
  - [Pressure]

Basic Algebra Skills and Concepts
- Uses of variables
  - In formulas (cubic inch displacement)

Basic Logic
- Deductive inductive

Basic Geometry Skills and Concepts
- Determination of area and volume of cylinders

Fundamental Operations (Calculation)

Use of computing devices and mechanical aids
- Calculators
- Computers

Basic Measurement Skills and Concepts
- Reading and interpreting tables, charts, and graphs
  - Torque Specification charts
- Instruments—Thickness gauge
- Given an Instrument of Measure, determine precision and/or accuracy with respect to relative error, significant digits, and tolerance—Tolerance, clearance, piston skirt

Uses of Numbers: (Without calculation)
- Coding, Coding—bit sizing

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Speaking	Customer complaint, Special checks	Terminology Logic
Reading	Specification chart, Test gauges & Instruments	Comprehension Terminology
Writing	Report—Cost estimate	Penmanship Spelling Terminology Logic
Listening	Squeaks, knocks, rattles	Auditory discrimination
Viewing	Oil leaks—fuel leaks	Visual analysis Symbols and codes
Touching	Rough or worn parts	Size Shape
Smelling	Burned or contaminated oil	Engine oil odors

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(TASK STATEMENT) F-4 SERVICE CRANKSHAFT AND BEARINGS

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON

S.T.K.
Torque wrench
Plastigauge
Micrometers
Rear oil seal installer

Engine block
Crankshaft
Bearings

PERFORMANCE KNOWLEDGE

Keep main and rod caps in order
Install rear main oil seal
Use micrometers, check crankshaft
Inspect bearing clearance with plastiguage
Torque rod and main bearings to specification

SAFETY – HAZARD

Wear safety glasses
Make sure engine block is secure

Keep foreign material out of eyes
Engine could drop or roll on hands or feet

DECISIONS

Determine if the crankshaft will operate correctly with new bearings

CUES

Crank measures undersize
Crank has taper or is out of round
Crank has too much end play

ERRORS

Engine will not last
Rods or mains will knock
Engine could tie up
Could ruin engine

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(TASK STATEMENT) F-4 SERVICE CRANKSHAFT AND BEARINGS

SCIENCE

Simple machines used to gain mechanical advantage—Gears, levers, pulleys
Work input, work output, friction and efficiency in simple machines—Horse power output
Fluids under pressure—Oil and fuel
Transfer of heat from one body to another—From combustion chamber to water jackets
Effects of friction on work processes and product quality—Power loss due to friction

The following principles of behavioral patterns should be included:

Professionalism
- Personality conflicts
- Communications
- Respect
  - for others
  - for tools and equipment, etc.
- Loyalty
  - To peers
    - Customers
    - Company
- Cooperative venture
  - Working together
  - Encouragement
  - Seek help of others (specialist)
  - Housekeeping

Dependability
- On time
- Regularity
- Accuracy of repair

Image
- Personal appearance
- Conduct
- Trade

MATH – NUMBER SYSTEMS

Set of Real Numbers
- Rationals

Uses of Numbers: (Without calculation)
- Compression Ratio

Basic Arithmetic Skills and Concepts
- Changing fractions to decimal and decimal to fractions—Bore and crankshaft
- Rounding off decimals and whole numbers—Crankshaft and camshaft

Basic Measurement Skills and Concepts
- Instruments—Micrometer Tachometer
- Given an Instrument of Measure, determine [illegible]n and/or accuracy with respect to relative error, significant digits, and tolerance—Crank[illegible] and bore
- Metric and English measure and conversion
- Measurement: Non-geometric
  - Liquid—Oil pressure
  - [Pressure]

Basic Algebra Skills and Concepts
- Uses of variables
  - In formulas (cubic inch displacement)

Basic Logic
- Deductive inductive

Basic Geometry Skills and Concepts
- Determination of area and volume of cylinders

Fundamental Operations (Calculation)

Use of computing devices and mechanical aids
- Calculators
- Computers

Basic Measurement Skills and Concepts
- Instruments—Plastiguage
- Given an Instrument of Measure, determine precision and/or accuracy with respect to relative error, significant digits, and tolerance—Oil

Uses of Numbers: (Without calculation)
- Coding

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Speaking	Customer complaint, special checks	Terminology Logic
Reading	Specification chart, Test gauges & Instruments	Comprehension Terminology
Writing	Report—cost estimate	Penmanship Spelling Terminology Logic
Listening	Squeaks, knocks, rattles	Auditory discrimination
Viewing	Oil leaks—fuel leaks	Visual analysis Symbols and codes
Touching	Rough or worn parts	Size Shape
Smelling	Burned or contaminated oil	Engine oil odors

DUTY G. SERVICING AND REPAIRING VALVE TRAINS

1. Diagnose valve train problems
2. Service valve train components

(TASK STATEMENT) G-1 DIAGNOSE VALVE TRAIN PROBLEMS

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON

S.T.K.
Oil pressure gauge
Compression gauge
Stethoscope
Cylinder leak down test

Valves
Cylinder heads
Rocker arms
Push arms
Push rods
Lifters
Camshaft
Timing chain
Timing gears

PERFORMANCE KNOWLEDGE

Check oil pressure with gauge
Check compression
Run cylinder leak down test
Test timing chain
Visually check rocker arm assembly

SAFETY – HAZARD

Use safety glasses
Keep loose clothing or long hair away from cranking engine

Foreign material in eyes
Moving parts may catch hair or loose clothing

DECISIONS

Determine that the problem is not oil pressure
Determine if compression is faulty
Determine if the fault is rings or valves
Determine that the timing chain is correct
Determine if the rocker assembly is in place and operable

CUES

Noisy lifters
Low reading on compression gauge
Air leak at carburetor, exhaust pipe, or oil base
Low compression on all cylinders
Broken or misplaced rocker assembly

ERRORS

Engine will not run
Engine will miss
Poor performance
Poor mileage

(TASK STATEMENT) G-1 DIAGNOSE VALVE TRAIN PROBLEMS

SCIENCE

Simple machines used to gain mechanical advantage—Gears, levers, pulleys
Work input, work output, friction and efficiency in simple machines—Horse power output
Fluids under pressure—Oil and fuel
Transfer of heat from one body to another—From combustion chamber to water jackets
Effects of friction on work processes and product quality—Power loss due to friction

The following principles of behavioral patterns should be included:

Professionalism
- Personality conflicts
- Communications
- Respect
  - for others
  - for tools and equipment, etc.
- Loyalty
  - To peers
    - Customers
    - Company
- Cooperative venture
  - Working together
  - Encouragement
  - Seek help of others (specialist)
  - Housekeeping

Dependability
- On time
- Regularity
- Accuracy of repair

Image
- Personal appearance
- Conduct
- Trade

MATH – NUMBER SYSTEMS

Set of Real Numbers
- Rationals

Uses of Numbers: (Without calculation)
- Compression Ratio

Basic Arithmetic Skills and Concepts
- Changing fractions to decimal and decimal to fractions—Bore and crankshaft
- Rounding off decimals and whole numbers—Crankshaft and camshaft

Basic Measurement Skills and Concepts
- Instruments—Micrometer Tachometer
- Given an Instrument of Measure, determine precision and or accuracy with respect to relative error, significant digits, and tolerance—Crankshaft and bore
- Metric and English measure and conversion
- Measurement: Non-geometric
  - Liquid—Oil pressure
  - [Pressure]

Basic Algebra Skills and Concepts
- Uses of variables
  - In formulas (cubic inch displacement)

Basic Logic
- Deductive inductive

Basic Geometry Skills and Concepts
- Determination of area and volume of cylinders

Fundamental Operations (Calculation)

Use of computing devices and mechanical aids
- Calculators
- Computers

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Speaking	Customer complaint, Special checks	Terminology Logic
Reading	Specification chart, Test gauges & Instruments	Comprehension Terminology
Writing	Report-Cost estimate	Penmanship Spelling Terminology Logic
Listening	Squeaks, knocks, rattles	Auditory discrimination
Viewing	Oil leaks—fuel leaks	Visual analysis Symbols and codes
Touching	Rough or worn parts	Size Shape
Smelling	Burned or contaminated oil	Engine oil odors

(TASK STATEMENT) G-2 SERVICE VALVE TRAIN COMPONENTS

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
S.T.K. Cleaning Solvents Valve spring compressor Valve face grinder Valve seat grinder Spring tension gauge Dampener puller Valves Cylinder heads Rocker arms Push rods Lifters Camshaft Timing chain Timing gears	Face valves Seat heads Clean and surface rocker arms Serivce lifters Check camshaft lobe lift Set timing chain and gears to specification	Wear safety glasses Wear face shield Foreign material in eyes Grinder emery dust is hazardous
DECISIONS	**CUES**	**ERRORS**
Determine that the valves will operate correctly See that the timing chain is installed correctly Determine that the lifters are not at fault	Check valves with blueing or like substance Lifters are sticking or varnished badly	Engine will miss Valves will be noisy Engine will not start

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(TASK STATEMENT) G-2 SERVICE VALVE TRAIN COMPONENTS

SCIENCE

Simple machines used to gain mechanical advantage—Gears, levers and pulleys
Work input, work output, friction and efficiency in simple machines—Foot and inch pound of torque
Fluids under pressure—Oil pressure
Transfer of heat from one body to another—Heat of combustion
Effects of friction on work processes and product quality—Power loss due to friction

The following principles of behavioral patterns should be included:

Professionalism
- Personality conflicts
- Communications
- Respect
  - for others
  - for tools and equipment, etc.
- Loyalty
  - To peers
  - Customers
  - Company
- Cooperative venture
  - Working together
  - Encouragement
  - Seek help of others (specialist)
  - Housekeeping

Dependability
- On time
- Regularity
- Accuracy of repair

Image
- Personal appearance
- Conduct
- Trade

MATH – NUMBER SYSTEMS

Set of Real Numbers
- Rationals

Uses of Numbers: (Without calculation)
- Compression Ratio

Basic Arithmetic Skills and Concepts
- Changing fractions to decimal and decimal to fractions—Bore and crankshaft
- Rounding off decimals and whole numbers—Crankshaft and camshaft

Basic Measurement Skills and Concepts
- Instruments—Micrometer Tachometer
- Given an Instrument of Measure, determine precision and or accuracy with respect to relative error, significant digits, and tolerance—Crankshaft and bore
- Metric and English measure and conversion
- Measurement: Non-geometric
  - Liquid—Oil pressure
  - [Pressure]

Basic Algebra Skills and Concepts
- Uses of variables
  - In formulas (cubic inch displacement)

Basic Logic
- Deductive/inductive

Basic Geometry Skills and Concepts
- Determination of area and volume of cylinders

Fundamental Operations (Calculation)

Use of computing devices and mechanical aids
- Calculators
- Computers

Basic Measurement Skills and concepts
Measurement: Geometric
Angle

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Speaking	Customer complaint, Special checks	Terminology Logic
Reading	Specification chart, Test gauges & Instruments	Comprehension Terminology
Writing	Report-Cost estimate	Penmanship Spelling Terminology Logic
Listening	Squeaks, knocks, rattles	Auditory discrimination
Viewing	Oil leaks—fuel leaks	Visual analysis Symbols and codes
Touching	Rough or worn parts	Size Shape
Smelling	Burned or contaminated oil	Engine oil odors

DUTY H. SERVICING AND REPAIRING IGNITION SYSTEMS

1. Diagnose ignition system problems
2. Service ignition systems components
3. Service and repair electronic ignition systems

(TASK STATEMENT) **H-1 DIAGNOSE INGNITION SYSTEM PROBLEMS**

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Oscilloscope Tach-dwell meter Timing light Distributor strobe Vacuum Gauge Combustion analyzer S.T.K. Spark Plugs Ignition wires Distributor Coil Resistor Ignition switch Points Condensor	Hook up oscilloscope assembly Run unit tests Analyze results	Wear safety glasses Do not wear loose fitting clothing Keep test wires and instruments clear of engine moving parts Beware of shock from wires Keep foreign object out of eyes Loose fitting clothes or long hair could catch in moving machinery Test wires or cables could catch in machinery Electric shock can be dangerous

DEC'SIONS	CUES	ERRORS
Determine system problem Determine needed repair	Pattern of scope oscillations Engine performance	Poor performance Poor or no start Poor mileage

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(TASK STATEMENT) H-1 DIAGNOSE IGNITION SYSTEM PROBLEMS

SCIENCE

Resistance of materials to flow of electrical current—Resistance wire
Magnetic fields of force—Ignition coil

The following principles of behavioral patterns should be included:

Professionalism
- Personality conflicts
- Communications
- Respect
  - for others
  - for tools and equipment, etc.
- Loyalty
  - To peers
    - Customers
    - Company
- Cooperative venture
  - Working together
  - Encouragement
  - Seek help of others (specialist)
  - Housekeeping

Dependability
- On time
- Regularity
- Accuracy of repair

Image
- Personal appearance
- Conduct
- Trade

MATH – NUMBER SYSTEMS

Set of Real numbers—Rationals
Uses of Numbers: (Without calculation)
- Indexing
- Timing

Fundamental Operations (Calculations)
Basic Arithmetic Skills and Concepts
- Ratio and proportion

Basic Measurement Skills and Concepts
- Instruments—Tach-dwell timing light 'Scope' etc.'
- Measurement: Geometric
  - Angle dwell
- Reading and interpreting tables, charts, and graphs
  - Logs-Tune up specifications

Basic Logic
- Deductive

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Speaking	Customer complaint	Terminology Logic
Reading	Specification chart	Comprehension Terminology
Writing	Test results, Cost estimate	Penmanship Spelling Logic
Listening	Engine miss—roughness	Auditory Discrimination Logic
Viewing	Spec chart symbols Wiring diagram	Visual analysis Logic Symbols, codes
Touching	Electric shock	Safety

(TASK STATEMENT) H-2 SERVICE IGNITION SYSTEMS COMPONENTS

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON

S.T.K.
Spark plug cleaner
Ohm meter
Distributor strobe
Timing light
Tach-dwell meter
Oscilloscope

Spark plubs
Ignition wires
Distributor
Coil
Resistor
Points
Condensor
Ignition switch

PERFORMANCE KNOWLEDGE

Remove and install necessary parts
Set distributor on distributor strobe
Retest on oscilloscope assembly
Adjust to specifications per test results

SAFETY – HAZARD

Wear safety glasses
Do not wear loose fitting clothing
Keep test wires and instruments clear of engine moving parts
Beware of shock from wires

Keep foreign object out of eyes
Loose fitting clothes or long hair could catch in moving engine parts
Test wires or cables could catch in engine parts
Electric shock can be dangerous

DECISIONS

Determine from retest results if the ignition system now functions properly

CUES

Poor starting
Rough idle
Poor performance

ERRORS

Results in poor performance
Possible breakdown
Poor mileage

(TASK STATEMENT) H-2 SERVICE IGNITION SYSTEMS COMPONENTS

SCIENCE

Resistance of materials to flow of electrical current — Resistance wire
Magnetic fields of force — Ignition coil

The following principles of behavioral patterns should be included:

Professionalism
- Personality conflicts
- Communications
- Respect
  - for others
  - for tools and equipment, etc.
- Loyalty
  - To peers
    - Customers
    - Company
- Cooperative venture
  - Working together
  - Encouragement
  - Seek help of others (specialist)
  - Housekeeping

Dependability
- On time
- Regularity
- Accuracy of repair

Image
- Personal appearance
- Conduct
- Trade

MATH – NUMBER SYSTEMS

Set of Real numbers — Rationals
Uses of Numbers: (Without calculation)
- Indexing
- Timing

Fundamental Operations (Calculations)
Basic Arithmetic Skills and Concepts
- Ratio and proportion

Basic Measurement Skills and Concepts
- Instruments — Tach-dwell timing light/Scope etc.
- Measurement: Geometric
  - Angle dwell
- Reading and interpreting tables, charts, and graphs
  - Logs-Tune up specifications

Basic Logic
- Deductive

Basic Measurement Skills and Concepts
- Instruments—Ohm meter

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Speaking	Customer complaint	Terminology Logic
Reading	Specification chart	Comprehension Terminology
Writing	Test results, Cost estimate	Penmanship Spelling Logic
Listening	Engine miss—roughness	Auditory Discrimination Logic
Viewing	Spec chart symbols Wiring diagram	Visual analysis Logic Symbols, codes
Touching	Electric shock	Safety

(TASK STATEMENT) H-3 SERVICE AND REPAIR ELECTRONIC IGNITION SYSTEMS

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Electronic test instruments Ohm meter S.T.K. Volt meter Amp meter Magnetic impulse distributor Amplifier Resistor Ignition coil	Test distributor on strobe instrument Test pulse amplifier Test resistor Test ignition coil	Wear safety glasses Beware of high voltage Beware of moving parts May get foreign material in eyes High voltage is dangerous Moving parts may catch loose clothing

DECISIONS	CUES	ERRORS
Determine which part or parts are functioning correctly	Engine not running Determine if test results agree with specification manuals	Road breakdown Hard start Poor performance

(TASK STATEMENT) H-3 SERVICE AND REPAIR ELECTRONIC IGNITION SYSTEMS

SCIENCE

Resistance of materials to flow of electrical current Resistance wire
Magnetic fields of force Ignition coil

The following principles of behavioral patterns should be included:

Professionalism
- Personality conflicts
- Communications
- Respect
  - for others
  - for tools and equipment, etc.
- Loyalty
  - To peers
    - Customers
    - Company
- Cooperative venture
  - Working together
  - Encouragement
  - Seek help of others (specialist)
  - Housekeeping

Dependability
- On time
- Regularity
- Accuracy of repair

Image
- Personal appearance
- Conduct
- Trade

MATH – NUMBER SYSTEMS

Set of Real numbers Rationals
Uses of Numbers: (Without calculation)
- Indexing
- Timing

Fundamental Operations (Calculations)
Basic Arithmetic Skills and Concepts
- Ratio and proportion

Basic Measurement Skills and Concepts
- Instruments Tach-dwell timing light Scope etc.
- Measurement: Geometric
  - Angle dwell
- Reading and interpreting tables, charts, and graphs
  - Logs-Tune up specifications

Basic Logic
- Deductive

Basic Measurement Skills and concepts
- Instruments—Voltmeter, ampmeter

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Speaking	Customer complaint	Terminology Logic
Reading	Specification chart	Comprehension Terminology
Writing	Test results, Cost estimate	Penmanship Spelling Logic
Listening	Engine miss—roughness	Auditory Discrimination Logic
Viewing	Spec chart symbols Wiring diagram	Visual analysis Logic Symbols, codes
Touching	Electric Shock	Safety

DUTY I. SERVICING AND REPAIRING BRAKING SYSTEMS (DRUM TYPE)

1. Diagnose brake system problems (drum type)
2. Overhaul brake components, adjust and bleed
3. Test and repair power brake units

(TASK STATEMENT) I-1 DIAGNOSE BRAKE SYSTEM PROBLEMS (DRUM TYPE)

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON

Dynomometer
Brake pressure bleeder

Brake drums
Brake shoes
Park brake cables and levers
Lines and hoses
Wheel and master cylinders
Spring and brake linkeage

PERFORMANCE KNOWLEDGE

Dyno test brake effeciency
Visual inspection
Performance test

SAFETY – HAZARD

Wear safety glasses
Keep brake fluid off hand and body
Support car on safety stands

Keep foreign material out of eyes
Brake fluid causes irritation
Hydraulic jacks are not safe

DECISIONS

Determine Dyno test results
Determine if all components pass visual inspection
Determine if brakes are in safe operating condition

CUES

Dyno test shows poor brake effeciency
Brake cylinders are leaking
Brake shoes are worn or broken

ERRORS

Brake failure
Brakes pull or fade
Poor or spongy brake pedal

(TASK STATEMENT) I-1 DIAGNOSE BRAKE SYSTEM PROBLEMS (DRUM TYPE)

SCIENCE

Simple machines used to gain mechanical advantage—Levers
Work input, work output, friction and efficiency in simple machines—Parking brake cables
Effect of heating and cooling on expansion of materials—Brake fade
Fluids under pressure—Master cylinder and wheel cylinder
Transfer of heat from one body to another—Lining to drum
Effects of friction on work processes and product quality—Brake fade

The following principles of behavioral patterns should be included:

Professionalism
- Personality conflicts
- Communications
- Respect
  - for others
  - for tools and equipment, etc.
- Loyalty
  - To peers
    - Customers
    - Company
- Cooperative venture
  - Working together
  - Encouragement
  - Seek help of others (specialist)
  - Housekeeping

Dependability
- On time
- Regularity
- Accuracy of repair

Image
- Personal appearance
- Conduct
- Trade

MATH – NUMBER SYSTEMS

Seat of real numbers
- Rationals

Fundamental Operations

Basic Arithmetic Skills and Concepts
- Ratio

Use of computing devices and mechanical aids
Computers—Dyno
Basic Measurement Skills and Concepts
- Instruments—Pressure bleeder

Basic Logic
- Deductive

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Speaking	Customer Information	Terminology Logic
Reading	Spec. Charts	Comprehension Terminology
Writing	Test result, Cost estimate	Penmanship Spelling Logic
Listening	Grinding, squeaks, squeals, scraping Fluid leaks—seepage	Auditory discrimination Logic
Viewing		Visual analysis Symbols, codes
Touching	Heat	Size Shape Temperature
Smelling	Fluid odor, Burning brake lining	Odor burning brake lining

(TASK STATEMENT) I-2 OVERHAUL BRAKE COMPONENTS, ADJUST AND BLEED

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON

S.T.K.
Brake bleeder
Wheel cylinder hone
Brake drum lathe
Special brake tools

Brake drums
Brake shoes
Brake cables
Wheel cylinders
Master cylinders
Brake springs and linkeage

PERFORMANCE KNOWLEDGE

Remove and replace wheels, brake drums and shoes
Remove, replace and / or overhaul wheel cylinders
Remove, replace and / or overhaul master cylinder
Replace brake shoes and springs as necessary
Bleed and adjust system
Dyno test

SAFETY – HAZARD

Wear safety glasses
Support car with safety stands
Make sure brake has sufficient pedal to safely stop car before test

May get foreign object in eye
Car may slip off jack
Would damage car or cause accident

DECISIONS

Determine if the job will meet safe operating conditions

CUES

Spongy pedal
Brake pull (right or left)
Pedal low
Brake fade

ERRORS

Brake failure
Strong possibility of accident
Auto damaged or destroyed
Driver hurt or killed

(TASK STATEMENT) I-2 OVERHAUL BRAKE COMPONENTS, ADJUST AND BLEED

SCIENCE

Simple machines used to gain mechanical advantage – Levers
Work input, work output, friction and efficiency in simple machines – Parking brake cables
Effect of heating and cooling on expansion of materials – Brake fade
Fluids under pressure – Master cylinder and wheel cylinder
Transfer of heat from one body to another – Lining to drum
Effects of friction on work processes and product quality – Brake fade

The following principles of behavioral patterns should be included:

Professionalism
- Personality conflicts
- Communications
- Respect
  - for others
  - for tools and equipment, etc.
- Loyalty
  - To peers
    - Customers
    - Company
- Cooperative venture
  - Working together
  - Encouragement
  - Seek help of others (specialist)
  - Housekeeping

Dependability
- On time
- Regularity
- Accuracy of repair

Image
- Personal appearance
- Conduct
- Trade

MATH – NUMBER SYSTEMS

Set of real numbers
- Rational

Fundamental Operations (Calculation)
Basic Measurement Skills and Concepts
- Instruments – Wheel cylinder hown
- Metric and English measure and conversion
- Measurement:Geometric
  - Volume – Cylinder bore
- Measurement: Non-geometric
  - Liquid – Brake fluid
- Reading and Interpreting tables, charts, and graphs
  - Logs – Spec. charts

Use of computing devices and mechanical aids
- Computers – Dyno

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Speaking	Customer Information	Terminology Logic
Reading	Spec. charts	Comprehension Terminology
Writing	Test result, Cost estimate	Penmanship Spelling Logic
Listening	Grinding, squeaks, squeals, scraping	Auditory discrimination Logic
Viewing	Fluid leaks – seepage	Visual analysis Symbols, codes
Touching	Heat	Size Shape Temperature
Smelling	Fluid odor, Burning brake lining	Odor burning brake lining

(TASK STATEMENT) **I-3 TEST AND REPAIR POWER BRAKE UNITS**

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TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
S.T.K. Vacuum gauge Power brake unit	Test power unit Remove, replace or repair Check for brake fluid in power unit	Wear safety glasses Block or support car Keep foreign material out of eyes such as brake fluid Car may move

DECISIONS	CUES	ERRORS
Determine if the unit is malfunctioning Determine if unit is repairable Determine if master cylinder is leaking fluid into unit	Hard pedal Vacuum leak Unit sticking	Stiff working pedal Brakes will not release easily

(TASK STATEMENT) I-3 TEST AND REPAIR POWER BRAKE UNITS

SCIENCE

Simple machines used to gain mechanical advantage—Vacuum operated levers
Work input, work output, friction and efficiency in simple machines—Torque step up from booster

The following principles of behavioral patterns should be included:

Professionalism
- Personality conflicts
- Communications
- Respect
  - for others
  - for tools and equipment, etc.
- Loyalty
  - To peers
    - Customers
    - Company
- Cooperative venture
  - Working together
  - Encouragement
  - Seek help of others (specialist)
  - Housekeeping

Dependability
- On time
- Regularity
- Accuracy of repair

Image
- Personal appearance
- Conduct
- Trade

MATH – NUMBER SYSTEMS

Set of Real numbers
- Rationals

Fundamental Operations (Calculation)
Basic Measurement Skills and Concepts
- Instruments - Vacuum gauge
- Measurement: Geometric
  - Volume
- Reading and interpreting tables, charts, and graphs
  - Logs - Spec. charts

Basic Logic
- Deductive

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Speaking	Customer Information	Terminology Logic
Reading	Spec. charts	Comprehension Terminology
Writing	Test result, Cost estimate	Penmanship Spelling Terminology Logic
Listening	Grinding, squeaks, squeals, scraping	Auditory discrimination
Viewing	Fluid leaks—seepage	Visual analysis Symbols and codes
Touching	Heat	Size Shape
Smelling	Fluid odor, Burning brake lining	Engine oil odors

DUTY J. SERVICING AND REPAIRING BRAKING SYSTEMS (DISC TYPE)

1. Diagnose disc brake problems
2. Service disc brake components

(TASK STATEMENT) **J-1 DIAGNOSE DISC BRAKE PROBLEMS**

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Dynomometer S.T.K. Brake tool kit Calipers Pads Rotors Control valves Front wheel bearings	Dyno test brake efficiency Visual inspection Performance test	Wear safety glasses Observe safety rules in use of dynomometer Use sound judgment on performance test Foreign objects High speed or power operation Possible poor braking conditions
DECISIONS	**CUES**	**ERRORS**
Determine need and extent of repair	Worn brake pads Damaged or grooved rotor Pulsing pedal Loose front wheel bearings	Dangerous condition of poor operating brakes Damage to car or driver or both Needless expensive repairs

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(TASK STATEMENT) J-1 DIAGNOSE DISC BRAKE PROBLEMS

SCIENCE

Simple machines used to gain mechanical advantage – Levers
Work input, work output, friction and efficiency in simple machines – Parking brake cables
Effect of heating and cooling on expansion of materials – Brake fade
Fluids under pressure – Master cylinder and calipers
Transfer of heat from one body to another – Pad to rotor
Effects of friction on work processes and product quality – Brake fade

The following principles of behavioral patterns should be included:

Professionalism
- Personality conflicts
- Communications
- Respect
  - for others
  - for tools and equipment, etc.
- Loyalty
  - To peers
    - Customers
    - Company
- Cooperative venture
  - Working together
  - Encouragement
  - Seek help of others (specialist)
  - Housekeeping

Dependability
- On time
- Regularity
- Accuracy of repair

Image
- Personal appearance
- Conduct
- Trade

MATH – NUMBER SYSTEMS

Set of Real numbers – Rationals
Fundamental Operations (Calculation)
Use of computing devices and mechanical aids
- Computers – Dyno

Basic Measurement Skills and Concepts
- Reading and interpreting tables, charts, and graphs
  - Logs – Spec. charts

Basic Logic
- Deductive

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Speaking	Customer Information	Terminology Logic
Reading	Spec Charts	Comprehension Terminology
Writing	Test results, Cost estimate	Penmanship Spelling Logic
Listening	Grinding, squeaks, squeals, scraping	Auditory discrimination Logic
Viewing	Fluid leaks—seepage	Visual analysis Symbols, codes
Touching	Heat	Size Shape Temperature
Smelling	Fluid odor, burning brake lining	Odor burning brake lining

(TASK STATEMENT) **J-2 SERVICE DISC BRAKE COMPONENTS**

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY -- HAZARD
S.T.K. Safety stands Brake tool kit Brake fluid Caliper assembly Pads Rotors Control valves	Remove and replace components Overhaul calipers Turn rotors Clean and check control valves	Wear safety glasses Double check all work Use safety stands Foreign objects could damage eyes Life depends on good brakes Car could come down on worker
DECISIONS	**CUES**	**ERRORS**
Determine if roters will turn and remain in specifications Determine if calipers are scored or cracked Determine if control valves are operable	Rotors scored deeply Brake pedal pulses	Dangerous brake failure Damage to car and occupants

(TASK STATEMENT) J-2 SERVICE DISC BRAKE COMPONENTS

SCIENCE

Simple machines used to gain mechanical advantage—Levers
Work input, work output, friction and efficiency in simple machines—Parking brake cables
Effect of heating and cooling on expansion of materials—Brake fade
Fluids under pressure—Master cylinder and calipers
Transfer of heat from one body to another—Pad to rotor
Effects of friction on work processes and product quality—Brake fade

The following principles of behavioral patterns should be included:

Professionalism
- Personality conflicts
- Communications
- Respect
  - for others
  - for tools and equipment, etc.
- Loyalty
  - To peers
    - Customers
    - Company
- Cooperative venture
  - Working together
  - Encouragement
  - Seek help of others (specialist)
  - Housekeeping

Dependability
- On time
- Regularity
- Accuracy of repair

Image
- Personal appearance
- Conduct
- Trade

MATH – NUMBER SYSTEMS

Set of Real numbers—Rationals
Fundamental Operations (Calculation)
Use of computing devices and mechanical aids
- Computers—Dyno

Basic Measurement Skills and Concepts
- Reading and interpreting tables, charts, and graphs
  - Logs—Spec. charts

Basic Logic
- Deductive

Basic measurement Skills and Concepts
- Metric and English measure and conversion
- Measurement—Geometric
  - Area—Rotor
- Instruments—Micrometer
- Measurements: Non-geometric
  - Speed—Stopping distance

Basic Logic
- Deductive

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Speaking	Customer Information	Terminology Logic
Reading	Spec Charts	Comprehension Terminology
Writing	Test results, Cost estimate	Penmanship Spelling Logic
Listening	Grinding, squeaks, squeals, scraping	Auditory discrimination Logic
Viewing	Fluid leaks—seepage	Visual analysis Symbols, codes
Touching	Heat	Size Shape Temperature
Smelling	Fluid odor, burning brake lining	Odor burning brake lining

DUTY K. SERVICING AND REPAIRING STEEIRNG UNITS

1. Diagnose steering system problems
2. Service manual steering components
3. Service power steering components

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(TASK STATEMENT) **K-1 DIAGNOSE STEERING SYSTEM PROBLEMS**

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Front end alignment unit S.T.K. Dynomometer Steering gear Wheels Ball joints Tie rod ends Idler arms Upper and lower control arms Power steering units	Dynomometer test Alignment check Lower control arm check Ball joint and tie rod check Check power steering units	Safety glasses Clothing and hair may get caught in moving parts

DECISIONS	CUES	ERRORS
Determine what unit or units are at fault Determine if it is alignment only Determine if power unit is at fault	Uneven tire wear Wear or scuff gauge Dyno test results Loose units	Tire wear Accidents Road failure

(TASK STATEMENT) K-1 DIAGNOSE STEERING SYSTEM PROBLEMS

SCIENCE

Simple machines used to gain mechanical advantage—Gears, levers
Work input, work output, friction and efficiency in simple machines—Steering gear box
Motion resulting from two or more forces acting on a point in a body—Force vs. Resistance

The following principles of behavioral patterns should be included

Professionalism
- Personality conflicts
- Communications
- Respect
  - for others
  - for tools and equipment, etc.
- Loyalty
  - To peers
    - Customers
    - Company
- Cooperative venture
  - Working together
  - Encouragement
  - Seek help of others (specialist)
  - Housekeeping

Dependability
- On time
- Regularity
- Accuracy of repair

Image
- Personal appearance
- Conduct
- Trade

MATH – NUMBER SYSTEMS

Set of Real numbers—Rationals
Uses of numbers: (Without calculation)
- Ratio—Gear box

Fundamental Operations (Calculation)
Basic Arithmetic Skills and Concepts
- Reduction of fractions—Alignment spec.

Use of computing devices and mechanical aids
- Computers—Dyno

Basic Measurement Skills and Concepts
- Instruments—Alignment rack
- Measurement: Geometric
  - Area—Angle (caster)

Basic Logic
- Deductive

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Speaking	Customer Information	Terminology Logic
Reading	Spec. Charts	Comprehension Terminology
Writing	Test results, Cost estimate	Penmenship Spelling Terminology Logic
Listening	Knock, rattle, squealing tire	Auditory discrimination Logic
Viewing	Featheredge, uneven wear	Visual analysis Logic Symbols
Touching	Featheredge	Consistency

(TASK STATEMENT, **K-2 SERVICING MANUAL STEERING COMPONENTS**

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
S.T.K. Manual Steering Unit Puller set Bushing drivers Bearing press Steering column Worn gear Sector Bearing Bushing Seals Gaskets	Remove, disassemble, clean and inspect Replace defective parts, reassemble, adjust and replace in car	Wear safety glasses Double check all work Foreign material may get in eyes Life depends on good steering

DECISIONS	CUES	ERRORS
Determine how to remove and what is the problem Determine which parts are defective	Loose steering gear Catch in steering Hard to steer	Accidents Road failure Tire wear

(TASK STATEMENT) K-2 SERVICING MANUAL STEERING COMPONENTS

SCIENCE

Simple machines used to gain mechanical advantage – Gears, levers
Work input, work output, friction and efficiency in simple machines – Steering gear box
Motion resulting from two or more forces acting on a point in a body – Force vs. Resistance

The following principles of behavioral patterns should be included

Professionalism
- Personality conflicts
- Communications
- Respect
  - for others
  - for tools and equipment, etc.
- Loyalty
  - To peers
    - Customers
    - Company
- Cooperative venture
  - Working together
  - Encouragement
  - Seek help of others (specialist)
  - Housekeeping

Dependability
- On time
- Regularity
- Accuracy of repair

Image
- Personal appearance
- Conduct
- Trade

MATH – NUMBER SYSTEMS

Set of Real numbers – Rationals
Uses of numbers: (Without calculation)
- Ratio – Gear box

Fundamental Operations (Calculation)
Basic Arithmetic Skills and Concepts
- Reduction of fractions – Alignment spec.

Use of computing devices and mechanical aids
- Computers – Dyno

Basic Measurement Skills and Concepts
- Instruments – Alignment rack
- Measurement: Geometric
  - Area – Angle (caster)

Basic Logic
- Deductive

Basic Measurement Skills and Concepts
- Reading and interpreting tables, charts, and graphs
  - Logs – Spec. charts

Basic Arithmetic Skills and Concepts
- Properties of the real number system
  - Identity of zero (+)

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Speaking	Customer Information	Terminology Logic
Reading	Spec. Charts	Comprehension Terminology
Writing	Test results, Cost estimate	Penmenship Spelling Terminology Logic
Listening	Knock, rattle, squealing tire	Auditory discrimination Logic
Viewing	Featheredge, uneven wear	Visual analysis Logic Symbols
Touching	Featheredge	Consistency

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(TASK STATEMENT) **K-3 SERVICE POWER STEERING COMPONENTS**

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
S.T.K. Puller set Seal drivers Bushing drivers Pressure gauge Power steering pumps Power steering gear boxes	Test, remove, disassemble and inspect Replace necessary parts, reassemble, adjust and test	Wear safety glasses Beware of oil under pressure hazard May get dirt or oil in eyes Line may break under pressure

DECISIONS	CUES	ERRORS
Determine from test results what has failed Determine from inspection what parts to replace	Noises Eratic steering Loss of power steering	Fluid leaks Improper steering Loss of power

(TASK STATEMENT) K-3 SERVICE POWER STEERING COMPONENTS

SCIENCE

Simple machines used to gain mechanical advantage—Steering gear box
Work input, work output, friction and efficiency in simple machines—Pump
Fluids under pressure—Pump

The following principles of behavioral patterns should be included:

Professionalism
- Personality conflicts
- Communications
- Respect
  - for others
  - for tools and equipment, etc.
- Loyalty
  - To peers
    - Customers
    - Company
- Cooperative venture
  - Working together
  - Encouragement
  - Seek help of others (specialist)
  - Housekeeping

Dependability
- On time
- Regularity
- Accuracy of repair

Image
- Personal appearance
- Conduct
- Trade

MATH – NUMBER SYSTEMS

Set of Real numbers—Rationals
Uses of numbers: (Without calculation)
- Ratio—Gear box

Fundamental Operations (Calculation)
Basic Arithmetic Skills and Concepts
- Reduction of fractions—Alignment spec.

Use of computing devices and mechanical aids
- Computers—Dyno

Basic Measurement Skills and Concepts
- Instruments—Alignment rack
- Measurement: Geometric
  - Area—Angle (caster)

Basic Logic
- Deductive

Basic Measurement Skills and Concepts
- Instruments—Oil pressure gauge
- Measurement: Geometric
  - Volume—Oil
- Measurement: Non-geometric
  - Liquid
- Reading and interpreting tables, charts, and graphs
  - Logs

Basic Arithmetic Skills and Concepts
- Properties of the real number system
  - Identity of zero (+)

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Speaking	Customer Information	Terminology Logic
Reading	Spec. Charts	Comprehension Terminology
Writing	Test results, Cost estimate	Penmenship Spelling Terminology Logic
Listening	Knock, rattle, squealing tire, belt slip	Auditory discrimination Logic
Viewing	Featheredge, uneven wear, belt loose, fluid leaks	Visual analysis Logic Symbols
Touching	Belt tension	Movement

DUTY L. REPAIRING AND ALIGNING FRONT END ASSEMBLIES

1. Diagnose front end problems
2. Service front end components

(TASK STATEMENT) **L-1 DIAGNOSE FRONT END PROBLEMS**

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TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Alignment rack Wheel balancer Dynomometer Upper and lower control arms Ball joints Tie rod end and linkage Wheel bearings Spindels	Dyno test Visual inspection Performance test	Wear safety glasses Loose clothing and long hair Foreign material may get into eyes Loose clothing or long hair may catch in moving parts

DECISIONS	CUES	ERRORS
Determine results of Dyno test Determine from visual inspection in front end components are safe Test drive and check problems	Tire wear Shimmy Too much play in steering	Accidents Tire wear Road failure

(TASK STATEMENT) L-1 DIAGNOSE FRONT END PROBLEMS

SCIENCE

Simple machines used to gain mechanical advantage – Steering linkage
Work input, work output, friction and efficiency in simple machines – Steering box
Motion resulting from two or more forces acting on a point in a body – Force vs. Resistance

The following principles of behavioral patterns should be included:

Professionalism
- Personality conflicts
- Communications
- Respect
  - for others
  - for tools and equipment, etc.
- Loyalty
  - To peers
    - Customers
    - Company
- Cooperative venture
  - Working together
  - Encouragement
  - Seek help of others (specialist)
  - Housekeeping

Dependability
- On time
- Regularity
- Accuracy of repair

Image
- Personal appearance
- Conduct
- Trade

MATH – NUMBER SYSTEMS

Set of Real numbers – Rationals
Use of computing devices and mechanical aids
- Computers – Dyno

Basic Logic
- Deductive

Basic Measurement Skills and Concepts
- Instruments – Alignment rack

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Speaking	Customer Information	Terminology Logic
Reading	Spec. Charts	Comprehension Terminology
Writing	Test results, Cost estimate	Penmanship Spelling Reports Terminology Clarity of expression
Listening	Knock, rattle, squealing tire	Auditory discrimination Noise discrimination
Viewing	Featheredge, uneven wear	Visual analysis Recognition of symbols

(TASK STATEMENT) **L-2 SERVICE FRONT END COMPONENTS**

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Alignment rack Puller set Special tool as required Front end alignment Upper and lower control arms Ball joints Tie rod ends and linkage Wheel bearings Bushings Spindels	Repair defective parts Check tire wear patterns Remove and replace defective parts Align front end	Wear safety glasses Support car properly for type of repair you are doing May get foreign object in eye Car may slip off jack and cause accident or damage to car

DECISIONS	CUES	ERRORS
Determine what parts are defective Determine how to remove and replace defective parts Determine from tire wear pattern what the problems are Determine if alignment is within specifications	Tire wear Shimmy Loose steering	Accidents Tire wear Road failure

(TASK STATEMENT) L-2 SERVICE FRONT END COMPONENTS

SCIENCE

Simple machines used to gain mechanical advantage—Steering linkage
Work input, work output, friction and efficiency in simple machines—Steering box
Motion resulting from two or more forces acting on a point in a body—Force vs. Resistance

The following principles of behavioral patterns should be included:

Professionalism
- Personality conflicts
- Communications
- Respect
  - for others
  - for tools and equipment, etc.
- Loyalty
  - To peers
    - Customers
    - Company
- Cooperative venture
  - Working together
  - Encouragement
  - Seek help of others (specialis
  - Housekeeping

Dependability
- On time
- Regularity
- Accuracy of repair

Image
- Personal appearance
- Conduct
- Trade

MATH – NUMBER SYSTEMS

Set of Real numbers—Rationals
Use of computing devices and mechanical aids
- Computers—Dyno

Basic Logic
- Deductive

Basic Measurement Skills and Concepts
- Instruments—Alignment rack

Basic logic
- Deductive

Basic Measurement Skills and Concepts
- Measurement: Geometric
  - Angle
- Metric measure and conversion
- Reading and interpreting tables, charts, and graphs
  - Logs-Alignment charts

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Speaking	Customer Information	Terminology Logic
Reading	Spec. Charts	Comprehension Terminology
Writing	Test results, Cost estimate	Penmanship Spelling Reports Terminology Clarity of expression
Listening	Knock, rattle, squealing tire	Auditory discrimination Noise discrimination
Viewing	Featheredge, uneven wear	Visual analysis Recognition of symbols

DUTY M. REPAIRING REAR AXLE AND DRIVE LINE

1. Diagnose rear axle and drive line problems
2. Service rear axle components

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(TASK STATEMENT) **M-1 DIAGNOSE REAR AXLE AND DRIVE LINE PROBLEMS**

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Dynomometer S.T.K. Stethoscope Protractor and level Rear axle assembly Drive line components	Dynomometer test Check noise with stethoscope Check drive line angle	Wear safety glasses Watch for moving parts Foreign material in eye Clothing or long hair may catch in moving parts

DECISIONS	CUES	ERRORS
Determine Dyno test results Determine what is making noise with stethoscope Determine if drive line angles are within specifications	Rear end noise Vibration	Road failure Vibrations and noise

(TASK STATEMENT) M-1 DIAGNOSE REAR AXLE AND DRIVE LINE PROBLEMS

SCIENCE

Simple machines used to gain mechanical advantage—Gears
Work input, work output, friction and efficiency in simple machines—Applied force
Centrifugal forces developed by bodies in rotation—Drive line
Effects of friction on work processes and product quality—Power loss due to friction

The following principles of behavioral patterns should be included:

Professionalism
- Personality conflicts
- Communications
- Respect
  - for others
  - for tools and equipment, etc.
- Loyalty
  - To peers
    - Customers
    - Company
- Cooperative venture
  - Working together
  - Encouragement
  - Seek help of others (specialist)
  - Housekeeping

Dependability
- On time
- Regularity
- Accuracy of repair

Image
- Personal appearance
- Conduct
- Trade

MATH – NUMBER SYSTEMS

Set of Real numbers—Rational
Fundamental Operations (Calculation)
Use of computing devices and mechanical aids
- Computers—Dyno

Basic Measurement Skills and Concepts
- Instruments—Stethoscope, protractor level (Nose angle)

Basic Logic
- Deductive

Basic Measurement Skills and Concepts
- Measurement: Non-geometric
  - Speed—(R.P.M.) (M.P.H.) N.H.V.

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Speaking	Customer complaint	Terminology Logic
Reading	Spec. chart	Comprehension Terminology
Writing	Test result, cost estimate	Penmanship Spelling Terminology Process report (instruction)
Listening	Noise level—Pitch	Auditory discrimination Logic
Viewing	Loose U. joints	Visual analysis Detail and inference Symbols & codes
Touching	Car vibration	Vibration

(TASK STATEMENT) M-2 SERVICE REAR AXLE COMPONENTS

RA

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
S.T.K. Special tools for type of rear axle servicing Micrometer U joint clamps Rear axle stand Rear axle assembly Axle bearing U joints Slip joints Carrier bearing	Disassemble, clean and inspect rear axle assemblies and drive line components Repair or replace and adjust defective parts Assemble, adjust and test rear axles and/or drive line components	Wear safety glasses Mounting of rear axle in stand May get foreign material in eye Loose mounting may cause accident or damage to rear axle assemblies

DECISIONS	CUES	ERRORS
Determine from inspection what parts are defective Determine from special manual how to replace and adjust replacement parts Determine from road test or dyno test if repairs meet manual specifications	Rear axle or drive line noise Vibration from drive line or rear axle	Road failure Vibration and/or rear end noise

(TASK STATEMENT) M-2 SERVICE REAR AXLE COMPONENTS

SCIENCE

Simple machines used to gain mechanical advantage—Gears
Work input, work output, friction and efficiency in simple machines—Applied force
Centrifugal forces developed by bodies in rotation—Drive line
Effects of friction on work processes and product quality—Power loss due to friction

The following principles of behavioral patterns should be included:

Professionalism
- Personality conflicts
- Communications
- Respect
  - for others
  - for tools and equipment, etc.
- Loyalty
  - To peers
    - Customers
    - Company
- Cooperative venture
  - Working together
  - Encouragement
  - Seek help of others (specialist)
  - Housekeeping

Dependability
- On time
- Regularity
- Accuracy of repair

Image
- Personal appearance
- Conduct
- Trade

MATH – NUMBER SYSTEMS

Set of Real numbers—Rational
Fundamental Operations (Calculation)
Use of computing devices and mechanical aids
- Computers—Dyno

Basic Measurement Skills and Concepts
- Instruments—Stethoscope, protractor level (Nose angle)

Basic Logic
- Deductive

Basic Measurement Skills and Concepts
- Measurement: Non-geometric
  - Speed (R.P.M.) (M.P.H.) N.H.V.

Basic Measurement Skills and Concepts
- Instrument—Micrometer
- Metric measure and conversion
- Measurement: Geometric
  - Angle—Nose
- Reading and interpreting tables, charts, and graphs
  - Logs—Rear end and drive line charts
- Measurement: Geometric
  - Linear

Basic Arithmetic Skills and Concepts
- Ratio and Proportion—Gear

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Speaking	Customer complaint	Terminology Logic
Reading	Spec. chart	Comprehension Terminology
Writing	Test result, cost estimate	Penmanship Spelling Terminology Process report (instruction)
Listening	Noise level—pitch	Auditory discrimination Logic
Viewing	Loose U. joints	Visual analysis Detail and inference Symbols & codes
Touching	Car Virbration	Vibration

DUTY N. REPAIRING TRANSMISSIONS (STANDARD)

1. Diagnose transmission problems (STD)
2. Service transmission components and repair

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(TASK STATEMENT) N-1 DIAGNOSE TRANSMISSION PROBLEMS (STD)

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON

S.T.K.
Stethoscope
Dynomometer or road test

Transmission (STD)
Shift linkage
Clutch

PERFORMANCE KNOWLEDGE

Dynomometer or road test
Check noise with stethoscope
Check shift linkage

SAFETY – HAZARD

Wear safety glasses
Beware of moving parts

May get foreign material in eye
Clothing or long hair may catch in moving parts

DECISIONS

Determine from dyno or road test what the problems are
Using stethoscope determine what gear or bearings are at fault
Determine if shift linkage meets manual spec.

CUES

Noise in transmission
Hard shifting

ERRORS

Road failure
Hard shifting

(TASK STATEMENT) N-1 DIAGNOSE TRANSMISSION PROBLEMS (STD)

SCIENCE

Simple machines used to gain mechanical advantage — Gears
Work input, work output, friction and efficiency in simple machines — Applied force power output
Effects of friction on work processes and product quality — Power loss due to friction

The following principles of behavioral patterns should be included:

Professionalism
- Personality conflicts
- Communications
- Respect
  - for others
  - for tools and equipment, etc
- Loyalty
  - To peers
    - Customers
    - Company
- Cooperative venture
  - Working together
  - Encouragement
  - Seek help of others (specialist)
  - Housekeeping

Dependability
- On time
- Regularity
- Accuracy of repair

Image
- Personal appearance
- Conduct
- Trade

MATH – NUMBER SYSTEMS

Set of Real numbers — Rationals
Fundamental Operations (Calculation)
Use of computing devices and mechanical aids
- Computers — Dyno

Basic Arithmetic Skills and Concepts
- Ration (gears)

Basic Measurement Skills and Concepts
- Instruments — Stethoscope
- Metric and English measure and conversion
- Measurement: Geometric
  - Angle — Gear helix
- Measurement: Non-geometric
  - Speed
- Reading and interpreting tables, charts, and graphs
  - Logs — Transmission charts

Basic Logic
- Deductive

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Speaking	Customer complaint	Terminology Logic
Reading	Spec. Chart	Comprehension Progress report Terminology
Writing	Test result, cost estimate	Penmanship Spelling Reports Terminology
Listening	Noise level—pitch, knocking sound	Auditory discrimination
Viewing	Loose U. joints	Visual analysis Detail and inference Recognition of symbols
Touching	Car vibration	Vibration

(TASK STATEMENT) N-2 SERVICE AND REPAIR TRANSMISSION PROBLEMS

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON

S.T.K.
Transmission stand
Clutch aligning tool
Puller set
Gear lube

Clutch
Transmission
Clutch release bearing
Linkage

PERFORMANCE KNOWLEDGE

Remove, disassemble, clean and inspect
Adjust, repair or replace defective parts
Assemble, adjust, test and install

SAFETY – HAZARD

Wear safety glasses
Weigh of transmission
Use of safety stands

May get foreign material in eye
Use transmission jack

Car may slip off jack and cause accident or damage to car

DECISIONS

Determine from inspection what parts are defective
Determine from service manual how to adjust, repair and replac parts
Determine if repairs are complete by dyno or road test

CUES

Clutch slipping
Noise in transmission

Hard shifting
Foreign material in gear case

ERRORS

Road failure
Damage transmission or clutch and linkage parts

(TASK STATEMENT) N-2 SERVICE AND REPAIR TRANSMISSION PROBLEMS

SCIENCE

Simple machines used to gain mechanical advantage—Gears
Work input, work output, friction and efficiency in simple machines—Applied force power output
Effects of friction on work processes and product quality—Power loss due to friction

The following principles of behavioral patterns should be included:

Professionalism
- Personality conflicts
- Communications
- Respect
  - for others
  - for tools and equipment, etc.
- Loyalty
  - To peers
    - Customers
    - Company
- Cooperative venture
  - Working together
  - Encouragement
  - Seek help of others (specialist)
  - Housekeeping

Dependability
- On time
- Regularity
- Accuracy of repair

Image
- Personal appearance
- Conduct
- Trade

MATH – NUMBER SYSTEMS

Set of Real numbers—Rationals
Fundamental Operations (Calculation)
Use of computing devices and mechanical aids
- Computers—Dyno

Basic Arithmetic Skills and Concepts
- Ration (gears)

Basic Measurement Skills and Concepts
- Instruments—Stethoscope
- Metric and English measure and conversion
- Measurement: Geometric
  - Angle—Gear helix
- Measurement: Non-geometric
  - Speed
- Reading and interpreting tables, charts, and graphs
  - Logs—Transmission charts

Basic Logic
- Deductive

Basic Measurement Skills and Concepts
- Instruments—Clutch aligning tool
- Measurement: Non-geometric
  - Liquid—Pts. gear lube

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Speaking	Customer complaint	Terminology Logic
Reading	Spec. Chart	Comprehension Progress report Terminology
Writing	Test result, cost estimate	Penmanship Spelling Reports Terminology
Listening	Noise level—pitch, knocking sound	Auditory discrimination
Viewing	Loose U. joints	Visual analysis Detail and inference Recognition of symbols
Touching	Car vibration	Vibration
Smelling	Burned clutch	

DUTY O. REPAIRING TRANSMISSIONS (AUTOMATIC)

1. Diagnose transmission probelms (AUTO)
2. Service transmission components

(TASK STATEMENT) **O-1 DIAGNOSE TRANSMISSION PROBLEMS (AUTO)**

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Dynomometer S.T.K. Oil pressure gauge Automatic transmission Torque convertor	Check automatic transmission fluid Administer pressure, temperature and dynomometer tests	Wear safety glasses Beware oil under pressure Use care in use of Dyno Foreign objects in eyes Oil could burn body Car under power and speed conditions

DECISIONS	CUES	ERRORS
Determine if fluid is full or contaminated Determine if pressures are at specified levels Determine if clutches or bands are malfunctioning	Brown or black (Discolored) fluid Low oil pressures Slipping shift points	Misquote problem and price Road break down

(TASK STATEMENT) O-1 DIAGNOSE TRANSMISSION PROBLEMS (AUTO)

SCIENCE

Fluids under pressure – Hydraulic transfer of pressure
Simple machines used to gain mechanical advantage – Planetary gears
Centrifugal forces developed by bodies in rotation – Used in torque convertor

The following principles of behavioral patterns should be included:

Professionalism
- Personality conflicts
- Communications
- Respect
  - for others
  - for tools and equipment, etc.
- Loyalty
  - To peers
    - Customers
    - Company
- Cooperative venture
  - Working together
  - Encouragement
  - Seek help of others (specialist)
  - Housekeeping

Dependability
- On time
- Regularity
- Accuracy of repair

Image
- Personal appearance
- Conduct
- Trade

MATH – NUMBER SYSTEMS

Set of real numbers
- Integers – Hydraulic pressures

Uses of Numbers: (without calculation)
- Counting – Band adjustment

Basic Measurement Skills and Concepts
- Measurement: Non-geometric – Torque wrench
  - Pressure
  - Temperature

Basic Logic
- Deductive

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Viewing	Spec. chart, Oil contamination	Visual analysis Detail and Inference Color Discrimination Recognition of symbols
Listening	Knock, slipping, scraping, buzzing – low oil	Noise discriminations
Writing	Analysis report, cost estimate	Penmanship Spelling Reports (Recommendation) Terminology Process Report Instruction
Reading	Shop manual – Spec chart	Comprehension Terminology
Smelling	Burned oil – odor	Odor

(TASK STATEMENT) **O-2 SERVICE TRANSMISSION COMPONENTS (AUTO)**

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
S.I.K. Special automatic transmission tools Transmission clutch press Automatic transmission torque converter	R & R automatic transmission and torque converter Disassemble, clean and inspect parts Rebuild and reassemble transmission Flush or replace converter	Wear safety glasses Flush cleaning solvents Secure transmission on trans. jack Support car on jack stands

DECISIONS	CUES	ERRORS
Determine the need to repair or replace parts (Clutch, bands, seals, etc.) Determine if the converter is reusable	Worn parts Plugged converter Cracked parts	Transmission will malfunction Car will break down May burn out transmission

(TASK STATEMENT) O-2 SERVICE TRANSMISSION COMPONENTS (AUTO)

SCIENCE

Fluids under pressure – Hydraulic transfer of pressure
Simple machines used to gain mechanical advantage – Planetary gears
Centrifugal forces developed by bodies in rotation – Used in torque convertor

The following principles of behavioral patterns should be included:

Professionalism
- Personality conflicts
- Communications
- Respect
  - for others
  - for tools and equipment, etc.
- Loyalty
  - To peers
    - Customers
    - Company
- Cooperative venture
  - Working together
  - Encouragement
  - Seek help of others (specialist)
  - Housekeeping

Dependability
- On time
- Regularity
- Accuracy of repair

Image
- Personal appearance
- Conduct
- Trade

MATH – NUMBER SYSTEMS

Set of real numbers
- Integers – Hydraulic pressures

Uses of Numbers: (without calculation)
- Counting – Band adjustment

Basic Measurement Skills and Concepts
- Measurement: Non-geometric – Torque wrench
  - Pressure
  - Temperature

Basic Logic
- Deductive

Basic measurement Skills and Concepts
- Measurement: Non-geometric
  - Liquid – Cleaning solution
- Instrument – Dial Indicator
- Measurement: Geometric
  - Linear

Basic Arithmetic Skills and Concepts
- Ratio and proportion

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Viewing	Spec. chart, Instruments	Visual Analysis Detail inference Color Discrimination
Reading	Wiring diagram, condition of wires	Comprehension Description of mechanism Terminology Process report instruction
Writing	Report analysis, cost estimate	Penmanship Spelling Reports (recommendation) Terminology Clarity of expression

DUTY P. MAINTAINING AND REPAIRING ELECTRICAL SYSTEMS

1. Diagnose electrical systems problems
2. Service and repair electrical systems components

(TASK STATEMENT) **P-1 DIAGNOSE ELECTRICAL SYSTEM PROBLEMS**

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON

S.T.K.
Volt-amp meter
Test light
Ohm meter

Generator
Regulator
Starter
Solonoid
Battery
Headlights
Taillights
Turn signals
Courtesy lights

PERFORMANCE KNOWLEDGE

Test generating system per specifications
Test starting circuit
Test battery
Check lights for operation

SAFETY – HAZARD

Wear safety glasses
Be careful of test equipment
Beware of hot wires or cables

Foreign material in eyes
Wires entangled in moving parts
Hot wires cause fires or burn hands

DECISIONS

Determine if charging circuit is functioning according to specifications
Determine if the cranking circuit is operating correctly (Amp draw) (cranking RPM)
See if battery is at peak performance
See if all lights work

CUES

Generator light on
Starter inoperative
Battery voltage low
Lights inoperative

ERRORS

Car will not start
Lights will not work

(TASK STATEMENT) P-1 DIAGNOSE ELECTRICAL SYSTEM PROBLEMS

SCIENCE

Simple machines used to gain mechanical advantage - Pulleys on generator gears on starter
Magnetic fields of force - Basis for electricity
Transfer of energy from one form to another - Mechanical to electrical - Electrical to mechanical
Resistance of materials to flow of electrical current - Wire size resistors

The following principles of behavioral patterns should be included:

Professionalism
- Personality conflicts
- Communications
- Respect
  - for others
  - for tools and equipment, etc.
- Loyalty
  - To peers
    - Customers
    - Company
- Cooperative venture
  - Working together
  - Encouragement
  - Seek help of others (specialist)
  - Housekeeping

Dependability
- On time
- Regularity
- Accuracy of repair

Image
- Personal appearance
- Conduct
- Trade

MATH – NUMBER SYSTEMS

Use of computing devices and mechanical aids
- Calculators - Electrical

Basic Measurement Skills and Concepts
- Given an Instrument of Measure, determine precision and/or accuracy with respect to relative error, significant digits, and tolerance - Calculators
- Instruments - Volt amp meter, continuity tester, Ohm meter, hydrometer
- Measurement: Non-geometric - Volt, amp, Ohm
- Reading and interpreting tables, charts, and graphs - Specification charts, wiring schematic

Use of Real numbers
- Rationals

Basic Logic
- Deductive

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	Wiring diagram, condition of wires	Comprehension Description of mechanism Terminology Process report instruction
Viewing	Spec. chart, Instruments	Visual analysis Detail and inference Recognition of symbols (Meters)
Writing	Report analysis, cost estimate	Penmanship Spelling Reports (Recommendations) Terminology Clarity of expression

(TASK STATEMENT) **P-2 SERVICE AND REPAIR ELECTRICAL SYSTEM COMPONENTS**

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
S.T.K. Volt-Amp meter Ohm meter Hydrometer Generator-regulator testor Bearing puller Battery lift strap Generator Regulator Starter Solonoid Battery Lights	Repair generator Repair starter Repair or replace solonoid Charge or replace battery Repair lights	Wear safety glasses Beware moving parts Beware hot wires Foreign material in eyes Test or run leads entangled in mo[illegible]s Hot wires cause fire or burns

DECISIONS	CUES	ERRORS
Determine if the generator can be repaired per. specifications Determine if starter can be repaired	Parts cost may exceed price of rebuilt unit Specification charts Parts cost sheet	Car may not start May stop on highway Battery may not hold charge

(TASK STATEMENT) P-2 SERVICE AND REPAIR ELECTRICAL SYSTEM COMPONENTS

SCIENCE

Simple machines used to gain mechanical advantage — Pulleys on generator gears on starter
Magnetic fields of force — Basis for electricity
Transfer of energy from one form to another — Mechanical to electrical — Electrical to mechanical
Resistance of materials to flow of electrical current — Wire size resistors

The following principles of behavioral patterns should be included:

Professionalism
- Personality conflicts
- Communications
- Respect
  - for others
  - for tools and equipment, etc.
- Loyalty
  - To peers
    - Customers
    - Company
- Cooperative venture
  - Working together
  - Encouragement
  - Seek help of others (specialist)
  - Housekeeping

Dependability
- On time
- Regularity
- Accuracy of repair

Image
- Personal appearance
- Conduct
- Trade

MATH – NUMBER SYSTEMS

Use of computing devices and mechanical aids
- Calculators — Electrical

Basic Measurement Skills and Concepts
- Given an Instrument of Measure, determine precision and/or accuracy with respect to relative error, significant digits, and tolerance — Calculators
- Instruments — Volt amp meter, continuity tester, Ohm meter, hydrometer
- Measurement: Non-geometric — Volt, amp, Ohm
- Reading and interpreting tables, charts, and graphs — Specification charts, wiring schematic

Use of Real numbers
- Rationals

Basic Logic
- Deductive

Basic Measurement Skills and Concepts
- Instruments — Battery charger
- Rate — Rate of charge
- Measurement: Non-geometric
  - Time

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Viewing	Wiring Diagram Condition of wires	Visual analysis Memory Detail and inference Recognition of symbols (include meters)
Writing	Report analysis Cost estimate	Penmanship Spelling Reports (recommendation) Terminology Clarity of expression
Viewing	Spec Chart, Instruments	Visual analysis Detail and inference Recognition of symbols (meters)

DUTY Q. SERVICING AND REPAIRING A/C UNIT

1. Diagnose a/c unit problems
2. Service and repair a/c components

(TASK STATEMENT) **Q-1 DIAGNOSE A/C UNIT PROBLEMS**

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD 106
S.T.K Charging station Volt-amp meter Compresser Clutch Dehydrator-Receiver (driver) Condensor Evaporator Thermostatic expansion valve (T.E.V.) Lines & fittings	Run performance test Check clutch operation Check sight glass	Wear safety glasses Beware moving engine parts Make sure test fittings are secure Foreign material in eyes, especially freon Test lines, clothing or hair may become entangled May leak oil or freon

DECISIONS	CUES	ERRORS
Determine performance results See if outlet temperature is correct	Outlet temperature low Foam in sight glass Clutch or belt slipping Oil around lines, seals, or fittings	No cooling Wrong repairs made

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(TASK STATEMENT) Q-1 DIAGNOSE A/C UNIT PROBLEMS

SCIENCE

Simple machines used to gain mechanical advantage - Pulleys on generator gears on starter
Magnetic fields of force - Basis for electricity
Transfer of energy from one form to another - Mechanical to electrical - Electrical to mechanical
Resistance of materials to flow of electrical current - Wire size resistors

The following principles of behavioral patterns should be included:

Professionalism
- Personality conflicts
- Communications
- Respect
  - for others
  - for tools and equipment, etc.
- Loyalty
  - To peers
    - Customers
    - Company
- Cooperative venture
  - Working together
  - Encouragement
  - Seek help of others (specialist)
  - Housekeeping

Dependability
- On time
- Regularity
- Accuracy of repair

Image
- Personal appearance
- Conduct
- Trade

MATH – NUMBER SYSTEMS

Basic Measurement Skills and Concepts
- Instruments - Charging station - Thickness gauge
- Reading and interpreting tables, charts, and graphs - Ambient temp. chart
- Measurement: Non-geometric
  - Temperature
  - Pressure
- Measurement: Geometric
  - Linear

Set of real numbers
- Rationals

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Viewing	Oil loss, sight glass, broken lines	Visual analysis Memory Detail and inference Color discrimination Recognition of symbols
Touching	Hot or cold	Temperature
Listening	Hiss of refrigerant leak	Noise discrimination
Reading	Spec. chart, ambient temperature	Comprehension Terminology Process report (instruction)
Writing	Analysis report, cost estimate	Clarity of expression Terminology

(TASK STATEMENT) **Q-2 SERVICE AND REPAIR A/C COMPONENTS**

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD 108.
S.T.K. Special clutch tools, Compressor tools R-12 Charging station Test goggles Leak tester Clutch Compressor Condensor Evaporator Drier T.E.V. Lines	Test and repair clutch Test and repair or replace compressor Check and or repair condensor Repair or replace evaporator Replace drier Check or replace T.E.V.	Wear safety goggles Beware moving parts Freon Hoses, test connections may catch in moving parts

DECISIONS	CUES	ERRORS
Determine if more expedient to repair or replace Determine if unit will now meet performance test	Cost is more to repair than to replace Sight glass clear Outlet temperature correct	A/C unit will not cool Compressor tie up

(TASK STATEMENT) Q-2 SERVICE AND REPAIR A/C COMPONENTS

SCIENCE

Simple machines used to gain mechanical advantage - Pulleys on generator gears on starter
Magnetic fields of force - Basis for electricity
Transfer of energy from one form to another - Mechanical to electrical - Electrical to mechanical
Resistance of materials to flow of electrical current - Wire size/resistors

The following principles of behavioral patterns should be included:

Professionalism
- Personality conflicts
- Communications
- Respect
  - for others
  - for tools and equipment, etc.
- Loyalty
  - To peers
    - Customers
    - Company
- Cooperative venture
  - Working together
  - Encouragement
  - Seek help of others (specialist)
  - Housekeeping

Dependability
- On time
- Regularity
- Accuracy of repair

Image
- Personal appearance
- Conduct
- Trade

MATH – NUMBER SYSTEMS

Basic Measurement Skills and Concepts
- Instruments - Charging station - Thickness gauge
- Reading and interpreting tables, charts, and graphs - Ambient temp. chart
- Measurement: Non-geometric
  - Temperature
  - Pressure
- Measurement: Geometric
  - Linear

Set of real numbers
- Rationals

Measurement: Non-geometric
- Torque

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Viewing	Oil loss, sight glass, broken lines	Visual analysis Memory Detail and inference Color discrimination Recognition of symbols
Touching	Hot or cold	Temperature
Listening	Hiss of refrigerant leak	Noise discrimination
Reading	Spec. chart, ambient temperature	Comprehension Terminology Process report (instruction)
Writing	Analysis report, cost estimate	Clarity of expression Terminology

ABBREVIATIONS

A/C—Air Condition
Auto-Automatic
Dyno—Dynomometer
Ign.—Ignition
Lube—Lubrication
M.P.H.—Miles Per Hour
N.H.V.—Noise, Harshness, Vibration
P/M—Preventive Maintenance
Pts.—Pints
Qt.—Quart
R.P.M.—Revolutions Per Minute
R & R—Remove and Replace
Specs.—Specification
S.T.K.—Standard Tool Kit:
- ⅜" drive socket set
- ½" drive socket set
- Pliers 4
- Screw drivers 6 3stp-3 Philip's
- Hammer 16 oz.
- Carbon Scraper

Std.—Standard
T.E.V.—Thermostatic Expansion Valve
√—check

Punches 5
Chisels 4
Thickness gauge 2 flat and round
End wrench ¼" to ⅞"
Combination wrench ⅜" to ⅞"
Tool Box